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# GEOLOGICAL INVESTIGATIONS IN THE FALKLAND ISLANDS DEPENDENCIES BEFORE 1940

BY RAYMOND J. ADIE*

[*MS. received 23 May 1957.*]

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## *Introduction*

From the time of its discovery until the latter years of the nineteenth centur Antarctica remained a *terra incognita* to the geologist, but in the early years c this century the Falkland Islands Dependencies attracted some academi interest, particularly from geologists. Undoubtedly this was mainly due to th fact that the Dependencies occupy one of the more accessible parts of the Ant arctic continent and also bear a close geological relationship to South America

Despite the relative importance of geology from a purely scientific view point, ships' captains seem to have been prejudiced against the majority of th early geologists who visited these regions. It is possible that this may hav been due to their bitter experience of geologists always wanting to land at th most inconvenient times and places. The majority of geologists who hav worked in the Antarctic from ships have had to adopt "hit and run" tactic in order to achieve results in the short space of time available to them. Thi enforced technique is particularly well illustrated by a short extract fro the narrative of the Belgian Antarctic Expedition, 1897–99, which Arctowsk accompanied as geologist and glaciologist:

> The captain showed himself very obliging; but with a little good-will we could hav landed in many other places and collected much more geological material than we did For this eighteenth landing he took me himself but for ten minutes only. A fe strokes of the oars brought us to the beach amid cries of 'Hurry up, Arctowski I gave a hammer to Tellefsen with orders to chip here and there down by the shor while I hurriedly climbed the moraine, picking up specimens as I ran, took th bearings with my compass, glanced to the left and right, and hurried down agai full speed to get a look at the rock *in situ*; meanwhile Cook had taken a photograp of the place from the ship—and that is the way geological surveys have to be carrie out in the Antarctic.

Unfortunately, many of the early geological observations in the Dependencie were recorded as passing remarks in the narratives of expeditions, or as com ments arousing excitement in the journals of ships' captains and surgeon

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Similarly, in the early days of Antarctic exploration, geological specimens were collected only as a matter of personal interest, and no scientific value was attached to them. Hence, the only early rock collection which exists to-day is that of Sir James Clark Ross.

The following review of the historical aspects of geological investigation in the Falkland Islands Dependencies up to 1940 is intended as a background to the present work of the Falkland Islands Dependencies Survey, which will be reviewed in a later paper.

### *South Georgia*

In the course of the German International Polar Year Expedition of 1882–83, H. Will[1] made the first collection of rock specimens from this island. This material, described carefully by H. Thurach,[2] included "phyllitgneis, phyllit, kalkphyllit, kornigen kalk, tonschiefer and diabastuff or schalstein". He also described a gradation in the metamorphism of these rocks from a clay-slate to a high-grade paragneiss with sillimanite and andalusite.

The Swedish South Polar Expedition, 1901–03, next visited South Georgia, and J. G. Andersson[3] and O. Nordenskjöld made a rapid survey of the more accessible parts of the island. Their most important discovery in the sediments and tuffs was a lamellibranch, which was described on the authority of Professor Koken as *Posidonia* (*Posidonomya*) of late Palaeozoic or early Mesozoic age. Andersson was also able to make some interesting comments on the general trend of the structural lines which ran parallel to the length of the island.

When W. Filchner's German South Polar Expedition briefly landed on South Georgia in 1911, F. Heim[4] geologically surveyed the whole of the north coast with the exception of Royal Bay and a part of Cumberland Bay. He recorded a succession of dark to blue-grey shales and greenish tuffs which he had also observed on the south-west coast. Heim was the first to discover the igneous rocks which form the south-east corner of the island and he described them as being "altvulkanischer". It was König, the expedition zoologist, who found the first ammonite fragment to be recovered from this area in a compact shale at Prince Olav Harbour.

The geological and prospecting expedition financed by Messrs Chr. Salvesen and Co. of Leith devoted the summer season of 1911–12 to a meticulous examination of a large part of the coast of South Georgia. D. Ferguson[5,6] attempted a stratigraphical division of the rocks, and accordingly divided the upper single conformable series of Cumberland Bay into three parts on the basis of colour. He also found that the Cumberland Bay Series rested unconformably upon the extremely indurated and highly contorted rocks of the Cape George Series. He concluded that the island had been faulted into a number of blocks. G. W. Tyrrell[7] examined Ferguson's collection and found them to be mostly sheared and slightly recrystallized tuffs with some argillaceous and arenaceous sediments. A number of fossil specimens, including a possible *Omphyma*, doubtful sponges, Camarocladoid organisms and radiolaria, collected by Ferguson from a locality near Leith Harbour, were described

by J. W. Gregory.[8] Later collections by whalers were also described by Tyrrell.[9,10]

In 1914 J. M. Wordie,[11] geologist of the Imperial Trans-Antarctic (*Endurance*) Expedition, 1914–17, spent four weeks in South Georgia. He concluded that the severity and configuration of the folding was such as to mislead previous observers; the sediments were in fact one single conformable succession, with fold axes striking parallel to the axis of the island.

G. V. Douglas,[12] geologist of the Shackleton-Rowett "*Quest*" Expedition 1921–22, spent some time in South Georgia. With the exception of suggesting the presence of an unconformity near Prince Olav Harbour he could find no reason to disagree with Wordie's previous conclusions. However, he made the extremely important discovery of a fossil wood identified by W. T. Gordon[13] as *Dadoxylon* (*Araucarioxylon*), which indicated that the age of the tuffs was certainly not older than Carboniferous and probably not younger than Jurassic. The specimens collected by Douglas were described petrographically by Tyrrell,[14] who, on the basis of petrographical differences, confirmed Ferguson's original subdivision into an older series of quartzo-greywackes and phyllites and a younger series of shales, mudstones and tuffs. He renamed these the Godthul Harbour Series and the Cumberland Bay Series respectively. The precise relationship between these rocks and the igneous rocks of south-east South Georgia still remained uncertain.

O. Holtedahl,[15] who visited South Georgia with the Norwegian Antarctic Expedition, 1927–28, has summarized the geology very clearly. He made a number of pertinent observations from which he concluded that the island consisted of a single Mesozoic sedimentary series. The lavas near the top of the succession he described as "appearing to belong to the sedimentary succession", whereas the igneous rocks in the south-east of the island bore a post- and para-tectonic relationship to the sediments. At Annenkov Island Rustad collected an ammonite fragment and a number of lamellibranchs from the sediments.[16] Holtedahl's rock specimens were described by T. F. W. Barth and P. Holmsen,[17] who particularly emphasized the metasomatic effects found throughout the sediments.

In 1928–29 the island was revisited by L. Kohl-Larsen,[18] who, although he was primarily interested in the geography, added greatly to the palaeontological information obtained in the previous season by Holtedahl and Rustad. Again he landed on Annenkov Island and collected not only lamellibranchs, fish-scales, a cirripede and numerous "lebenspuren", but also a number of ammonites which O. Wilckens[19,20] assigned to an Upper Aptian age.

### *South Sandwich Islands*

The earliest geological records of the South Sandwich Islands were from sealing and whaling captains who reported signs of volcanic activity with varying degrees of exaggeration. In 1823 B. Morrell,[21] an American, reported that he saw in this area "nine burning volcanoes" and that "three of the islands had vomited out so much of their entrails that their surfaces were nearly even

with the water". J. Brown, who passed Visokoi Island in 1830, described "a burning mountain with smoke issuing in different places".[22] In the same year John Biscoe passed by these islands and made similar reports.

Although it seems likely that others sailed through the South Sandwich Islands in the intervening years, there is no further record of discovery until Captain C. A. Larsen landed on Zavodovski Island in 1908. His landing was most exciting and in fact almost catastrophic. It is reported that the fumes which issued from cracks in the ground almost poisoned him and he remained an ill man for some months following. The rocks which Larsen collected were carefully described by Baeckström,[23] who maintained they were all of an andesitic and basaltic affinity.

In 1911 W. Filchner[24] passed close to Leskov Island and he recorded "puffs of white cloud, perhaps steam" coming from the top of the island.

During the voyage of the *Quest* (1922) F. Wild[25] succeeded in landing on Zavodovski Island, where he made an interesting collection of the volcanic rocks, which have been described by Douglas and W. Campbell Smith.[26] Volcanism was clearly still in progress, because he reported "caves on the southern side, from the mouths of which sulphurous fumes were issuing in a reddish cloud".

Although Holtedahl[15] never landed in the South Sandwich Islands, he has made brief mention in his report of the activity of Candlemas Island in January 1929. His field notes were summarized by Barth and Holmsen.[17]

About this time a number of whaling ships passed through the South Sandwich Islands and most of them observed signs of volcanic activity, but there were no landings.

During the first commission of *Discovery II* a landing was effected in February 1930 on Thule Island and a number of important geological specimens were collected *in situ*. These rocks were subsequently described by Tyrrell[27] as "dacites and pyroxene-andesites". In a later report Tyrrell[28] has given an excellent summary of the geology of the whole island group, and he mentions in addition to the rocks described above "olivine-basalts of a youthful character".

### *South Shetland Islands*

William Smith, in the brig *Williams*, first sighted these islands in February 1819. He returned later in October of the same year and landed on the north-east part of King George Island. Among the material on the beach where he landed Smith found numerous large and small "bluish-grey slaty pieces", while he "suspected" the surrounding cliffs to be composed of "chlorite slate or schistose hornblende".[29] Specimens of minerals and rocks from this locality must have been collected and brought back to England, where they were examined by a certain Dr B. Astor, who pronounced them to be of a volcanic origin. These mineral specimens, which were later displayed by Dr Mitchell, included "crystalline quartz and amethyst, porphyry, onyx pebbles, firestone, beautiful zeolites, pumice stone and iron pyrites".[30]

Another collection of minerals and rocks, obtained from the Liverpool

sealers who had voyaged to the same region, fell into the hands of Dr T. S. Traill,[31] who described them as "basaltic rock, beautiful apophyllite crystals, stilbite, quartz-lined druses with zeolites, chalcedony, calcite and iron pyrites".

It is also reported that G. Powell collected soils from the South Shetland Islands during his early voyages and handed them over to the Royal Society for examination.

The early accounts of the South Shetland Islands have always included a great deal of information on the volcanic activity of Deception and Bridgeman Islands. In December 1821 Powell described "smoke emerging from a crater on the west side of Bridgeman Island". When J. Weddell[32] passed within two hundred yards of this same island he observed "smoke issuing through fissures of the rock and apparently with much force". Both Dumont d'Urville[33] and Charles Wilkes,[34] who sailed by Bridgeman Island in 1838 and 1839 respectively, confirmed earlier observations emphasizing "the strong sulphurous smell". Lynch and Eldred[35] landed on Bridgeman Island in 1880 and there they killed a fur seal which "had the fur all burnt off on one side". "They thought that as Bridgeman Island was smoking at the time, perhaps this seal had been in contact with hot lava or volcanic fires." In view of later reports this description appears to be a little exaggerated. However, by December 1909, when J.-B. Charcot sailed close to Bridgeman Island, he could find no trace of volcanic activity.

The earliest detailed report of Deception Island is that of E. N. Kendall,[36] who visited the island with H.M.S. *Chanticleer* in 1829. He recorded "signs of volcanic activity and numerous hot springs with a temperature of 88° Centigrade. Streams of hydrogen sulphide and steam were emitted from the crater and there were fumaroles along the shores of the basin between high and low water marks." A similar description of Deception Island was given by W. H. B. Webster,[37] who also was on board *Chanticleer* at the time.

Johnson,[34] who visited Deception Island in 1838, reported "boiling springs and small craters three to four feet in diameter, from which heated vapour is constantly issuing, accompanied by much noise". Smiley[34] embellished this description somewhat by saying that "the whole southern side of Deception Island appeared as if on fire", and he actually "counted thirteen volcanoes in action".

During the voyage of the Swedish South Polar Expedition ship *Antarctic*, landings were made on Nelson Island, Snow Island and the east point of Livingston Island, where Andersson[38] collected a greenish porphyrite and dark coloured eruptives. Unfortunately all these specimens were lost when the *Antarctic* sank in the Weddell Sea.

Charcot passed through the South Shetland Islands during his two voyages in 1903–05 and 1908–10, but few landings were made and observations on the geology were accordingly brief.[86–88]

Ferguson,[39] who was employed in 1911–14 by Messrs Chr. Salvesen and Co of Leith to undertake prospecting operations, devoted most of his time in the the South Shetland Islands to a study of King George Island but he also visited Nelson, Robert, Greenwich, Livingston and Deception Islands, all of

which he reported to be of volcanic origin. He also described the Elephant and Clarence Island group briefly. Most of his geological specimens were handed over to Tyrrell[40] for petrographic description.

After the loss of the *Endurance* in 1916, the expedition made an enforced landing on Elephant Island, where the geologist, Wordie,[11] was able to make a collection of rock specimens.

Smaller collections from the South Shetland Islands have been described by H. H. Thomas,[41] Douglas[42] and C. E. Tilley,[43] who concluded that the majority of the rocks were volcanic in origin.

In 1927–28 Holtedahl[15] visited a number of localities in the South Shetland Islands. Although he concentrated most of his attention on Deception Island, he was able to make certain observations on Clarence Island. His many specimens were given to Barth and Holmsen,[44,17] who described the petrography in detail. The soda-rich volcanic rocks of Deception Island were described with special care and certain detailed mineralogical work upon an unusual tridymite/nepheline mineral was done by Barth and A. Kvalheim.[45]

In the course of the third and fourth commissions of *Discovery II*, 1933–35 and 1935–37, many landings were made in the South Shetland Islands, and a large collection, most of which was volcanic, was made. Tyrrell[28] has described this material with particular emphasis on the unusual volcanic assemblage at Deception Island. He has also summarized the geology of the South Shetland Islands up to the time of his publication in 1945.

### *Graham Land*

In 1829 H.M.S. *Chanticleer*, commanded by H. Foster, voyaged among the islands on the north-west of Gerlache Strait, where Webster[46] noticed "granite or syenite".

From the geological point of view perhaps the most important of the early voyages of discovery in this area was that of Sir James Clark Ross,[47] who, with the *Erebus* and *Terror*, explored the islands off Trinity Peninsula in 1843. He succeeded in making landings on Cockburn Island, where he collected olivine-basalts, granitic rocks, and a calcareous glauconitic sandstone. These important rock specimens, the first to be recovered from this region, were lodged in a museum, but it was not until 1899, as a result of pressure from Sir John Murray for geological information on Antarctica, that they were described by Prior.[48]

In the latter part of the nineteenth century, when the Dundee whalers were active in the northern approaches to the Weddell Sea, T. Robertson succeeded in obtaining rock specimens (beach pebbles), including granitic and basaltic rocks and a red jasper with traces of radiolaria, from Dundee Island in 1893.[49]

About the same time Larsen, in *Jason*, landed twice on Seymour Island, where he discovered fossil molluscs of a Lower Tertiary age and also trunks of fossil wood.[50,51]

H. Arctowski,[52–54] who accompanied the Belgian Antarctic Expedition, 1897–99, was the first geologist to conduct a systematic survey in Graham Land and it is now clear that his results were not proportional to the effort

put into the work. He made an interesting collection of Jurassic volcanics and Early Tertiary intrusives from the Danco Coast, in spite of his great difficulty in persuading the captain of the ship to allow him to make landings along the coast. Perhaps the most important part of Arctowski's activities were his glaciological observations,[55,56] which led him to the conclusion that the Antarctic ice-sheet was in fact receding and had a much greater extent in the past.

S. Weller[57] described the first Cretaceous fossils from Snow Hill Island. These he obtained from F. W. Stokes, an American artist who accompanied the Swedish South Polar Expedition on the understanding that he would not divulge any scientific information before the expedition had published their results.

The first major contribution to our geological knowledge of Graham Land was that of O. Nordenskjöld's Swedish South Polar Expedition, 1901–03, which explored much of the north-east part of Trinity Peninsula and the James Ross Island group and carried out important stratigraphical, structural and palaeontological investigations.[3,38,58–61] Their work gave us the first detailed accounts of the remarkable Middle Jurassic flora[62–65] of Hope Bay, and of the abundant Upper Cretaceous and Tertiary faunas and floras of Seymour, Cockburn, Snow Hill and James Ross Islands.[66–80] Although a lot of petrological material was collected, most of it was unfortunately lost when the *Antarctic* sank in the Weddell Sea. This was indeed a great loss and detracted greatly from the valuable contribution of Bodman[81] to the petrology of this area.

The results of the geological work of J. Charcot's expeditions in the *Français*, 1903–05,[82–85] and *Pourquoi Pas?*, 1908–10,[86–91] included the first accounts of the petrology of the Jurassic andesitic volcanics and the Anden granites, diorites and gabbros of the north-west coast and Marguerite Bay.

The prospecting expedition of 1913–14, which was organized by Ferguson[39,40] on behalf of Messrs Chr. Salvesen and Co. of Leith, examined many of the well-known harbours of the Danco Coast and confirmed the earlier investigations by the *Français* expedition.

A part of the programme of the Norwegian Antarctic Expeditions, 1927–29, was devoted to the study of the physiography and geology of the more accessible parts of north-west Graham Land. The physiographical observations of Holtedahl,[15] who compared the genesis of the west coasts of Graham Land and Norway, were particularly interesting. The petrological collections were described by Barth and Holmsen.[17,44]

Various collections of igneous rocks from the outlying islands and the north-west coast of the peninsula have also been described by D. Stewart.[92–95]

Although the greater part of the long-term research programme of the Discovery Committee was of an oceanographical and marine biological character, several important igneous rock collections, described by Tyrrell,[28] were made on the west coast of Graham Land.

The British Graham Land Expedition, 1934–37, was responsible for the early exploration of the south-west coast of Graham Land from its bases at the Argentine and Debenham Islands. Their discovery of Basement Complex

metamorphics in Marguerite Bay and the identification of a thick fossiliferous "Jurassic" sedimentary succession on the east coast of Alexander Land were two major contributions to the geology of this area.[96] Their work also included important geomorphological and glaciological observations.[97]

The geology of Marguerite Bay and southern Graham Land was further investigated by the United States Antarctic Service Expedition, 1939–41, from a base situated on Stonington Island. Parts of the west and east coasts of the peninsula were examined geologically,[98] and the "greywacke-shale series", already well known in the Hope Bay area, was found to recur at several localities on the east coast of the peninsula south of Three Slice Nunatak. At several localities Anden granites and diorites, similar to those recorded on the north-west coast, were observed intruding the sediments. They also made a number of glaciological observations[99] which supplemented those made previously by the British Graham Land Expedition.

### *South Orkney Islands*

In February 1827 Weddell[100] briefly described the South Orkney Islands as "without soil and reared in columns of impenetrable rock". From this time until February 1838, when Dumont d'Urville[101] landed on Weddell Island, no ships visited this area. On his return to France d'Urville learned that certain whalers had brought rocks, said to be of volcanic origin, from these islands to the Natural History Museum of Edinburgh. However, his careful inquiries yielded no results.

During the period 1902–04 the Scottish National Antarctic Expedition established a base on Laurie Island, and explored many islands in the group. J. H. Harvey Pirie,[102–104] the doctor and geologist, was able to make a number of extremely acute structural and stratigraphical observations and recorded a thick succession of folded greywackes and shales on Laurie Island. From Graptolite Island he obtained some important fossil material: a graptolite identified as *Pleurograptus* and a Phyllocarid crustacean allied to *Discinocaris*. On Coronation Island he recorded a younger conglomerate resting on the greywacke-shale series, and which has since been found to have a fairly wide extent. Pirie not only devoted his attentions to the geology but also recorded very complete observations on the glaciology.[105]

Although he never visited the South Orkney Islands, Holtedahl[15] described a number of specimens brought to him from Signy Island by Captain Berntsen in 1928. This material included gneisses, limestones and schists, all of which showed a high degree of metamorphism. Many of Holtedahl's petrological observations were later reiterated by Barth and Holmsen.[17]

In the course of hydrographic and biological investigations during the third commission of *Discovery II*, landings were made at a number of places in the South Orkney Islands in January 1933. The specimens they recovered were of great interest and their petrography has been described in detail by Tilley,[106] who concluded that there were two distinct groups of rocks: (1) an older series of highly metamorphosed garnetiferous gneisses, phyllitic schists and coarsely

crystalline limestones; and (2) a younger series of quartzo-felspathic greywackes and interbedded shales, which are associated with a group of conglomerates resting upon them.

The only other description of rocks from the South Orkney Islands is that of Stewart[92] who has described a number of specimens obtained from the collections of the Scottish National Antarctic Expedition.

## *References*


[1] H. Will. Das Exkursionsgebiet der Deutschen Polarstation auf Süd-Georgien in geognostischer, floristischer und faunistischer Beziehung. *Deutsche geographische Blätter*, Vol. 7, 1884, p. 116–44.

[2] H. Thurach. Geognostische Beschreibung der Insel Süd-Georgien. *International Polarforschung 1882–83: die Deutsche Expedition*, Vol. 2, No. 7, 1890, p. 109–66.

[3] J. G. Andersson. On the principal geological results of the Swedish Antarctic Expedition. *Compte Rendu de la Xème Session du Congrès Géologique International, Mexico, 1906*. Vol. 10, Pt. 2, 1907, p. 725–33.

[4] F. Heim. Geologische Beobachtungen über Süd-Georgien. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, No. 6, 1912, p. 451–56.

[5] D. Ferguson, G. W. Tyrrell *and* J. W. Gregory. The geology of South Georgia. *Geological Magazine*, Vol. 1, Decade 6, 1914, p. 53–64.

[6] D. Ferguson. Geological observations in South Georgia. *Transactions of the Royal Society of Edinburgh*, Vol. 50, Pt. 4, No. 23, 1915, p. 797–814.

[7] G. W. Tyrrell. The petrology of South Georgia. *Transactions of the Royal Society of Edinburgh*, Vol. 50, Pt. 4, No. 25, 1915, p. 823–36.

[8] J. W. Gregory. The geological relations and some fossils of South Georgia, *Transactions of the Royal Society of Edinburgh*, Vol. 50, Pt. 4, No. 24, 1915, p. 817–22.

[9] G. W. Tyrrell. Further notes on the petrography of South Georgia. *Geological Magazine*, Vol. 3, Decade 6, 1916, p. 435–41.

[10] G. W. Tyrrell. Additional notes on the petrography of South Georgia. *Geological Magazine*, Vol. 5, Decade 6, 1918, p. 483–89.

[11] J. M. Wordie. Shackleton Antarctic Expedition, 1914–17: geological observations in the Weddell Sea area. *Transactions of the Royal Society of Edinburgh*, Vol. 53, Pt. 1, No. 2, 1921, p. 17–27.

[12] G. V. Douglas. Topography and geology of South Georgia. *Report on the geological collections made during the voyage of the "Quest"*.... London, British Museum (Natural History), 1930, p. 4–24.

[13] W. T. Gordon. A note on *Dadoxylon* (*Araucarioxylon*) from the Bay of Isles. *Report on the geological collections made during the voyage of the "Quest"*.... London, British Museum (Natural History), 1930, p. 24–27.

[14] G. W. Tyrrell. The petrography and geology of South Georgia. *Report on the geological collections made during the voyage of the "Quest"*.... London, British Museum (Natural History), 1930, p. 28–54.

[15] O. Holtedahl. On the geology and physiography of some antarctic and sub-antarctic islands.... *Scientific results of the Norwegian Antarctic Expeditions, 1927–28*. Oslo, No. 3, 1929.

[16] O. Wilckens. Fossilien und Gesteine von Süd-Georgien. *Scientific results of the Norwegian Antarctic Expeditions, 1927–28*, Oslo, No. 8, 1932.

[17] T. F. W. Barth *and* P. Holmsen. Rocks from the Antarctandes and the Southern Antilles. *Scientific results of the Norwegian Antarctic Expeditions, 1927–28*. Oslo, No. 18, 1939.

[18] L. Kohl-Larsen. Die Deutsche Süd-Georgien-Expedition, 1928–29. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, No. 6, 1930, p. 321–50.

[19] O. Wilckens. Geologische Ergebnisse der Deutschen Süd-Georgien Expedition Dr Kohl-Larsen 1928–29. *Geologische Rundschau*, Band 28, 1937, p. 127–28.

[20] O. Wilckens. Palaeontologische und geologische Ergebnisse der Reise von Kohl-Larsen (1928–29) nach Süd-Georgien. *Abhandlungen der senckenbergischen Naturforschenden Gesellschaft*, Vol. 474, 1947, p. 1–75.

[21] B. Morrell. *A narrative of four voyages*.... New York, 1832, p. 66.

[22] E. Fanning. *Voyages round the world*.... London, 1834, p. 440–43.

[23] O. Baeckström. Petrographische Beschreibung einiger Basalte von Patagonien, Westantarktika und den Süd-Sandwich-Inseln. *Bulletin of the Geological Institution of the University of Upsala*, Vol. XIII, Pt. 1, Paper 5, 1915, p. 115–82.

[24] W. Filchner. *Zum sechsten Erdteil.* Berlin, 1922, p. 111.

[25] F. Wild. *Shackleton's last voyage.* London, 1923, p. 85, 347.

[26] G. V. Douglas *and* W. Campbell Smith. Zavodovski Island, and notes on rock fragments dredged in the Weddell Sea. *Report on the geological collections made during the voyage of the "Quest"....* London, British Museum (Natural History), 1930, p. 63–67.

[27] G. W. Tyrrell. Report on rock specimens from Thule Island, South Sandwich Islands. *Discovery Reports,* Cambridge, 1931, Vol. 3, p. 191–97.

[28] G. W. Tyrrell. Report on rocks from West Antarctica and the Scotia Arc. *Discovery Reports,* Cambridge, 1941, Vol. 23, p. 37–102.

[29] J. Miers. Account of the discovery of New South Shetland, with observations on its importance in a geographical, commercial and political point of view: with two plates. *Edinburgh Philosophical Journal,* Vol. 3, No. 6, 1820, p. 367–80.

[30] Anon. Notizen über das neue südliche Land. *Neue allgemeine geographische (und statistische) Ephemeriden,* Vol. 9, Pt. 4, 1821, p. 514–15.

[31] T. S. Traill. Mineralogische Notiz von und aus Neu-Süd-Shetland. *Neue allgemeine geographische (und statistische) Ephemeriden,* Vol. 10, Pt. 1, 1822, p. 99–102.

[32] J. Weddell. *A voyage towards the South Pole,* London, 1827, p. 133.

[33] J. S. G. Dumont d'Urville. *Voyage au Pôle Sud.... Histoire du Voyage.* Paris, 1842, Tome 1, Pt. 2, p. 142–43.

[34] C. Wilkes. *Narrative of the United States Exploring Expedition....* Philadelphia, 1844, Vol. 1, p. 140, 148–49.

[35] E. S. Balch. Antarctica addenda. *Journal of the Franklin Institute,* 1904, p. 83–84.

[36] E. N. Kendall. An account of the island of Deception, one of the New Shetland Isles. *Journal of the Royal Geographical Society,* Vol. 1, No. 4, 1831, p. 62–66.

[37] W. H. B. Webster. *Narrative of a voyage to the Southern Atlantic Ocean.* London, 1834, Vol. 1, p. 144–45; Vol. 2, p. 300–01.

[38] J. G. Andersson. On the geology of Graham Land. *Bulletin of the Geological Institute of the University of Upsala,* Vol. 7, 1904–05, p. 19–71.

[39] D. Ferguson. Geological observations in the South Shetlands, the Palmer Archipelago, and Graham Land, Antarctica. *Transactions of the Royal Society of Edinburgh,* Vol. 53, Pt. 1, No. 3, 1921, p. 29–55.

[40] G. W. Tyrrell. A contribution to the petrography of the South Shetland Islands, the Palmer Archipelago, and the Danco Land Coast, Graham Land, Antarctica. *Transactions of the Royal Society of Edinburgh,* Vol. 53, Pt. 1, No. 4, 1921, p. 57–79.

[41] H. H. Thomas. On the Innes Wilson collection of rocks and minerals from the South Shetland Islands and Trinity Island. *Transactions of the Royal Society of Edinburgh,* Vol. 53, Pt. 1, No. 5, 1921, p. 81–89.

[42] G. V. Douglas. Geological results of the Shackleton-Rowett (*Quest*) Expedition. *Quarterly Journal of the Geological Society of London,* Vol. 79, Pt. 1, Proceedings, 1923, p. x–xiii.

[43] C. E. Tilley. Petrographical notes on rocks from Elephant Island, South Shetlands. *Report on the geological collections made during the voyage of the "Quest"....* London, British Museum (Natural History), 1930, p. 55–62.

[44] T. F. W. Barth. Notes on igneous and palingenic rocks from the Antarctic Archipelago.... *Proceedings of the Sixth Pacific Science Congress* (1939), Vol. 2, 1940, p. 747–54.

[45] T. F. W. Barth *and* A. Kvalheim. Christensenite, a solid solution of nepheline in tridymite. *Scientific results of the Norwegian Antarctic Expeditions 1927–28 et sqq.* Oslo, No. 22, 1944.

[46] W. H. B. Webster. *Narrative of a voyage to the Southern Atlantic Ocean in the years 1828, 29, 30....* London, 1834, Vol. 1, p. 144–45; Vol. 2, p. 300–01.

[47] J. C. Ross. *A voyage of discovery and research in the Southern and Antarctic Regions, during the years 1839–43.* London, 1847, Vol. 2, p. 335.

[48] G. T. Prior. Petrographical notes on the rock specimens collected in Antarctic regions during the voyage of H.M.S. *Erebus* and *Terror* under Sir James Clark Ross, in 1839–43. *Mineralogical Magazine,* Vol. 12, No. 55, 1899, p. 69–91.

[49] A. Geikie. Notes on some specimens of rocks from the Antarctic regions. *Proceedings of the Royal Society of Edinburgh,* Vol. 22, No. 1, 1897–98, p. 66–70.

[50] G. Sharman *and* E. T. Newton. Note on some fossils from Seymour Island, in the Antarctic regions, obtained by Dr Donald. *Transactions of the Royal Society of Edinburgh,* Vol. 37, Pt. 3, No. 30, 1894–95, p. 707–09.

[51] G. Sharman. Notes on some additional fossils collected at Seymour Island, Graham's Land, by Dr Donald and Captain Larsen. *Proceedings of the Royal Society of Edinburgh,* Vol. 22, No. 1, 1897–98, p. 58–61.

[52] H. Arctowski. Géographie physique de la région antarctique visitée par l'expédition de la *Belgica. Bulletin de la Société Royale Belge de Géographie,* Tom. 24, No. 1, 1900, p. 93–175.

[53] A. Pelikan. Petrographische Untersuchung der Gesteinsproben. I. Teil, *Résultats du voyage du S.Y. Belgica en 1897–1898–1899. Rapports scientifiques, Géologie*, Vol. 1, 1909, p. 1–49.

[54] D. Sistek. Petrographische Untersuchungen der Gesteinsproben. II. Teil. *Résultats du voyage du S.Y. Belgica en 1897–1898–1899. Rapports scientifiques, Géologie*, Vol. 2, 1912, p. 1–20.

[55] H. Arctowski. Sur l'ancienne extension des glaciers dans la région des terres découvertes par l'expédition antarctique belge. *Compte Rendu de la 8ème session du Congrès Géologique International*. Paris, 1900.

[56] H. Arctowski. Sur les glaciers et la géologie des terres découvertes par l'expédition antarctique belge et sur les glaces du Pole Sud. *Compte Rendu de la 8ème session du Congrès Géologique International*. Paris, 1900, Vol. 8, Pt. 1, 1901, p. 380.

[57] S. Weller. The Stokes collection of antarctic fossils. *Journal of Geology*, Vol. 11, No. 4, 1903, p. 413–19.

[58] O. Nordenskjöld. Petrographische Untersuchungen aus dem westantarktischen Gebiete. *Bulletin of the Geological Institution of the University of Upsala*, Vol. 6, Pt. 2, 1905, p. 234–46.

[59] O. Nordenskjöld. Die geologischen Beziehungen zwischen Südamerika und der angrenzenden Antarktika. *Compte rendu du XIe Congrès Géologique International*, 1910, p. 759–65.

[60] O. Nordenskjöld. Die Schwedische Südpolar-Expedition und ihre geographische Tätigkeit. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, 1911, Bd. 1, Lief. 1, p. 1–232.

[61] O. Nordenskjöld. Antarktis. *Handbuch der Regionalen Geologie*, Heidelberg. Band 8, Abteilung 6, Heft 15, 1913, 1–29.

[62] T. G. Hallé. Om de antarktiska trakternas juraflora. *Geologiska Föreningens Förhandlinger*, Stockholm, Band 35, Heft 2, No. 289, 1913, p. 105–06.

[63] T. G. Hallé. The mesozoic flora of Graham Land. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 14, 1910.

[64] A. G. Nathorst. Sur la flore fossile des régions antarctiques. *Compte Rendu des Séances de l'Académie des Sciences (Paris)*, Tome 138, No. 23, 1904, p. 1447–50.

[65] A. G. Nathorst. On the Upper Jurassic flora of Hope Bay, Graham Land. *Compte Rendu du Xème Congrès Géologique International, Mexico, 1906*, Vol. 10, Pt. 2, 1907, p. 1269–70.

[66] S. S. Buckman. Antarctic fossil Brachiopoda collected by the Swedish South Polar Expedition, 1901–03. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 7, 1908, p. 1–43.

[67] P. Dusén. Über die tertiäre Flora der Seymour-Insel. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 3, 1908, p. 1–27.

[68] J. Felix. Über die fossilen Korallen der Snow Hill-Insel und Seymour-Insel. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Bd. 3, Lief. 5, 1909, p. 1–15.

[69] W. Gothan. Die fossilen Hölzer von der Seymour- und Snow Hill-insel. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 8, 1908, p. 1–33.

[70] H. Hennig. Le conglomérat pleistocène à Pecten de l'île Cockburn. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 10, 1911, p. 1–73.

[71] R. Holland. The fossil Foraminifera. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 9, 1910, p. 1–11.

[72] W. Kilian. Sur une faune d'ammonites néocrétacée, recueillie par l'expédition antarctique suédoise. *Compte rendu des Séances de l'Académie des Sciences (Paris)*, Tome 142, No. 5, 1906, p. 306–08.

[73] W. Kilian *and* P. Reboul. Sur une faune néocrétacée des régions antarctiques. *Compte rendu de l'association française pour l'avancement des sciences*, 1909, p. 440–53.

[74] W. Kilian *and* P. Reboul. Les Céphalopodes néocrétacés des îles Seymour et Snow-Hill. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 6, 1909, p. 1–75.

[75] J. Lambert. Les echinides fossiles des îles Snow-Hill et Seymour. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 11, 1910, p. 1–15.

[76] A. Smith-Woodward. On fossil fish-remains from Snow Hill and Seymour Islands. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 4, 1908, p. 1–4.

[77] O. Wilckens. Die Anneliden, Bivalven und Gastropoden der antarktischen Kreideformation. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 12, 1910, p. 1–132.

[78] O. Wilckens. Die Mollusken der antarktischen Tertiärformation. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 13, 1912, p. 1–42.

[79] C. Wiman. Vorläufige Mitteilung über die alttertiären Vertebraten der Seymourinsel. *Bulletin of the Geological Institution of the University of Upsala*, Vol. 6, Pt. 2, No. 12, 1905, p. 249–52.

[80] C. Wiman. Über die alttertiären Vertebraten der Seymourinsel. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 1, 1905, p. 1–37.

[81] G. Bodman. Petrographische Studien über einige antarktische Gesteine. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–03*, Stockholm, Bd. 3, Lief. 15, 1916, p. 1–100.

[82] E. Gourdon. Les roches éruptives grenues de la Terre de Graham recueillies par l'expédition antarctique du Dr Charcot. *Compte rendu des Séances de l'Académie des Sciences*, Tome 141, No. 24, 1905, p. 1036–38.

[83] E. Gourdon. Les roches microlithiques de la Terre de Graham recueillies par l'expédition antarctique du Dr Charcot. *Compte rendu des Séances de l'Academie des Sciences*, Tome 43, No. 3, 1906, p. 178–80.

[84] E. Gourdon. Sur un microgranite alcalin recueilli sur la Terre de Graham par l'expédition antarctique du Dr Charcot. *Compte rendu des Séances de l'Académie des Sciences*, Tome 144, No. 22, 1907, p. 1224–26.

[85] E. Gourdon. *Géographie physique, Glaciologie, Pétrographie des régions visitées par l'Expédition Antarctique Française commandée par le Dr Charcot.* Paris, 1908.

[86] E. Gourdon. Sur deux gisements des zéolites dans l'Antarctique. *Compte rendu des Séances de l'Académie des Sciences*, Tome 151, No. 2, 1910, p. 153–54.

[87] E. Gourdon. Sur la constitution minéralogique des Shetlands du Sud (île Déception). *Compte rendu des Séances de l'Académie des Sciences*, Tome 158, No. 8, 1914, p. 583–86.

[88] E. Gourdon. Sur la constitution minéralogique des Shetlands du Sud. *Compte rendu des Séances de l'Académie des Sciences*, Tome 158, No. 25, 1914, p. 1905–07.

[89] E. Gourdon. Sur la constitution minéralogique de l'île Jenny (Antarctique). *Compte rendu des Séances de l'Académie des Sciences*, Tome 159, No. 5, 1914, p. 369–71.

[90] E. Gourdon. Minéralogie-géologie. *Deuxième Expédition Antarctique Française 1908–1910. Documents scientifiques.* Paris. 1917.

[91] E. Gourdon. Relación de los trabajos de geología y glaciología, ejecutados en la Antártida por la misión a orden del Doctor Charcot (1908–10). *Boletin del instituto geográfico argentino*, Vol. 24, 1919, p. 128–38.

[92] D. Stewart. Petrography of some rocks from the South Orkney Islands and the Antarctic Archipelago. *American Mineralogist*, Vol. 22, No. 3, 1937, 178–94.

[93] D. Stewart. Igneous rocks of the Melchior Islands, Antarctica. *Bulletin of the Geological Society of America*, Vol. 53, No. 12, 1942, p. 1809.

[94] D. Stewart. Preliminary report on some intrusives of the Melchior Islands, Antarctica. *Proceedings of the American Philosophical Society*, Vol. 89, No. 1, 1945, p. 146–47.

[95] D. Stewart. Rocks of the Melchior Islands, Antarctica. *Proceedings of the American Philosophical Society*, Vol. 91, No. 3, 1947, p. 229–33.

[96] W. L. S. Fleming *et al.* Notes on the scientific work of the British Graham Land Expedition, 1934–37. *Geographical Journal*, Vol. 91, No. 6, 1938, p. 508–32.

[97] W. L. S. Fleming. Relic glacial forms on the western seaboard of Graham Land, *Geographical Journal*, Vol. 96, No. 2, 1940, p. 95–100.

[98] P. H. Knowles. Geology of southern Palmer Peninsula, Antarctica. *Proceedings of the American Philosophical Society*, Vol. 89, No. 1, 1945, p. 132–45.

[99] P. H. Knowles. Glaciology of Southern Palmer Peninsula, Antarctica. *Proceedings of the American Philosophical Society*, Vol. 89, No. 1, 1945, p. 174–76.

[100] J. Weddell. *A voyage towards the South Pole.* London, 1825, p. 42.

[101] J. S. C. Dumont d'Urville. *Voyage au Pôle Sud, Histoire du Voyage*, Paris, 1842, Vol. 2, p. 70, 316–17.

[102] J. H. H. Pirie. First Antarctic voyage of the *Scotia*. V. Note on the geology of the South Orkneys. *Scottish Geographical Magazine*, Vol. 20, 1904, p. 130.

[103] J. H. H. Pirie. On the Graptolite-bearing rocks of the South Orkneys. *Proceedings of the Royal Society of Edinburgh*, Vol. 25, Pt. 6, 1905, p. 463–70.

[104] J. H. H. Pirie. Geology of the South Orkneys, 1–10. Unpublished Scottish National Antarctic Expedition Report.

[105] J. H. H. Pirie. Glaciology of the South Orkneys: Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh*, Vol. 49, Pt. 4, No. 15, 1913, p. 831–63.

[106] C. E. Tilley. Report on rocks from the South Orkney Islands. *Discovery Reports, Cambridge*, 1935, Vol. 10, p. 383–90.

# CREVASSE RESCUE

BY E. W. K. WALTON

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## *Three crevasse accidents*

In August 1946 John Tonkin, navigator at the Falkland Islands Dependencies Survey station on Stonington Island in Marguerite Bay, Graham Land, was leading a team of dogs half a mile from the station. As the path was a well-trodden one he was not wearing skis. Four other men were in the party. He was walking close in front of the lead dog when suddenly he disappeared down a hidden crevasse. Fortunately it was a very narrow one and he stuck about 40 ft. down, jammed by the thickness of his body, and with his legs hanging free. Other men were called from the station and came to his rescue with rope, but no pulley block. First, ropes with loops on their ends were lowered, and Tonkin managed to put his arms through the loops, and so acquire some feeling of security. The narrowness of the crevasse meant that a rescuer had to be lowered spread-eagled with his weight taken in loops of rope clove-hitched around the instep. It also prevented the free use of an ice axe, and the process of chipping Tonkin free was carried out slowly with the ferrule and spike sawn off the end of an ice axe. Two hours after the accident Tonkin was hauled to the surface by means of the original ropes looped round his arms. The strain of his weight on the ropes damaged the nerves of his arms, and a partial paralysis resulted for several months.

* * * *

During the winter of 1947 two members of the Ronne Antarctic Research Expedition were returning from a field camp 17 miles from Stonington Island. They had undergone a period of severe physical strain and this undoubtedly caused them to relax their normal caution. With 9 miles to go one of them removed his skis to enable himself to walk more easily in rough snow, and almost immediately fell down a crevasse. His companion, reassured that he was alive, marked the place with a ski and went on to base to summon help. Six hours later a rescue party, with two dog sledges and equipment, including two snatch blocks and 600 ft. of rope, reached the place and began preparations for the rescue. An overturned sledge, handle bars down, was placed across the 3 ft. wide crevasse, and a snatch block was lashed to its lower side.

The crevasse was lighted by an Aldis signal lamp. The doctor, who was a mountaineer, was then lowered, supported by a triple bowline round his waist and thighs. He was wearing crampons and carrying a whistle with which he gave signals to direct the party above. About 120 ft. down he found the victim of the accident, wedged across an insecure snow bridge, after having the impetus of his fall broken by several other snow bridges. In twenty minutes they were both on the surface, and the victim suffered no major injury. The ease and speed of the rescue operations were undoubtedly increased by the use of a snatch block and the amount of pulling power available.

* * * * * *

Another accident occurred during the South Georgia Survey, 1951. The geologist, Alec Trendall, was stooping to pick up a specimen while standing on the upper edge of a steep snow slope, when he slipped and disappeared into the bergschrund. Five other members of the party were close at hand and had 360 ft. of 1 in. nylon rope with them. Trendall slid over two snow bridges before coming to rest on a third, about 150 ft. down, with a dislocated leg. One member of the party, carrying a whistle for signals, was lowered as far as the second snow bridge and passed the rope on to Trendall. Acting on instructions, he managed to secure himself to it by means of a triple bowline with his weight on his thighs, and leaving a 40 ft. tail of rope below him. There were only four men left on top to pull and snow conditions made the use of a karabiner, used in conjunction with a good anchor, impracticable. Three men provided the pulling power and the fourth, some way back from the edge, sat straddling a ski driven vertically into the snow. He acted as a live belay to the incoming rope, holding on or paying out as necessary. Trendall was pulled up with the other man in the crevasse guiding him past projections by means of the tail of rope, up which he himself later climbed.

### *Precautions against crevasse accidents*

Each of these accidents occurred in different circumstances and required different action; they had however one factor in common, they would not have happened if proper precautions had been taken, though there were understandable reasons for their neglect in each case. It seems worth reviewing these precautions, however well known and obvious they may be. They are:

(1) To treat all glaciers as dangerous until it has been proved beyond doubt that there are no crevasses, and to be prepared to carry this precaution to seemingly ridiculous extremes.

(2) To travel with some definite rope connexion to the sledge, probably using a karabiner.

(3) To wear a nylon line wound four or five times around the waist with a karabiner clipped on, to provide a comfortable and convenient attachment to a rescue rope.

(4) To beware of any relaxation of these precautions when tired after long periods of cold or forced inactivity.

*Preparations for rescue*

*At base.* All members of expeditions should practise certain knots and techniques until they become automatic. The knots are bowline, bowline on bight, triple bowline, sheet bend, butterfly and Prusik. A reef knot should never be used for joining climbing ropes, and the use of the "overhand middleman" knot is strongly deprecated. The purpose of perfecting certain techniques is to ensure the best use of the man power available for pulling.

The main techniques are: (*a*) After firmly anchoring the rope by which the man is hanging, it is necessary to relieve the severe constriction on his chest by dropping the other end of the rope, or another rope, with a loop in the end for him to stand in (Fig. 1). He can pass this rope through his chest loop to prevent

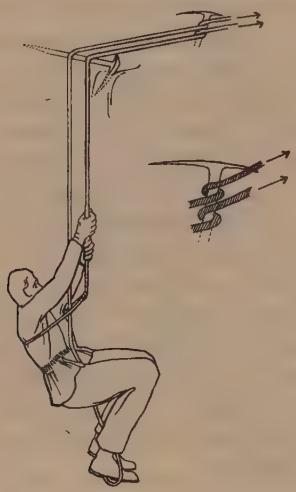


Fig. 1. Single rope hoist.

Fig. 2. Double rope hoist.

falling backwards during the ascent. An ice axe, or other object, placed at the edge of the crevasse will prevent the rope from cutting into the snow. Both ropes are belayed round an ice axe. The victim grasps the climbing rope firmly and raises his feet as high as possible, allowing the man above to take up the stirrup rope. The victim then stands up and repeates the process. The rescuer takes up each rope alternately while the weight is on the other one. (*b*) When two ends of rope are available, an improvement on (*a*) is to give the hanging man two stirrup loops (Fig. 2). As the victim raises each foot alternately the rescuer can take up the slack rope. Both of these methods are only suitable for short hauls; otherwise the elasticity of the rope makes them ineffective. Both are also very difficult for an injured man. (*c*) Use of the Prusik knot (Fig. 3) enables a man to rescue himself, and has many applications. The knot holds tightly when weight is applied, but will slide easily when unweighted. Two stirrup loops of light line are fastened by Prusik knots to the climbing rope (Fig. 4). By moving the stirrups alternately up the rope it is possible to

climb it, but this requires considerable practice. A chest loop to a third Prusik knot above the other two secures the climber against loss of balance and allows rests when required. (*d*) If the victim is injured the double karabiner hoist (Fig. 5) is a useful expedient. If available, a snatch block fastened to an upturned sledge straddling the crevasse is more efficient.

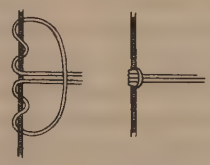


Fig. 3. Prusik knot.

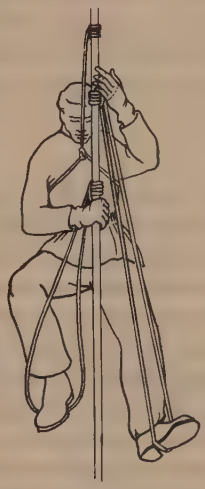


Fig. 4. Climbing by means of Prusik knot.

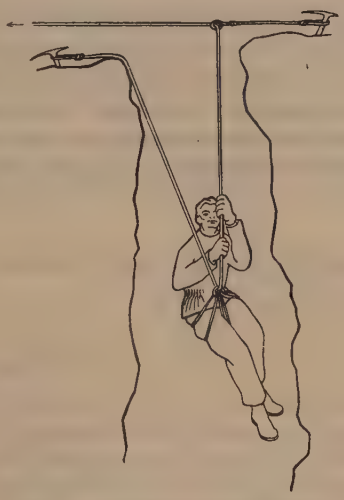


Fig. 5. Double karabiner hoist.

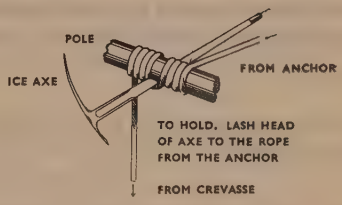



Fig. 6. "Spanish windlass", using an ice axe as a lever.

Various forms of anchorage should be mentioned: ice pitons, ice bollards, wooden "dead men", ice axes, skis, upturned sledges. Normal methods of pulling on the rope may be supplemented by a Spanish windlass (Fig. 6), or by a sideways pull on an already taut rope. Whistle drill is most important; it

is almost impossible to hear a shout at the surface from 100 ft. down a crevasse, and even more difficult to hear a shout from above.

*In the field.* Every man should carry a 15 ft. length of nylon line round his waist with a karabiner clipped to it. Karabiners should be large enough to be used with gloved hands and made of not less than $\frac{1}{2}$ in. diameter rod. A 200 ft. length of 1 in. nylon rope, an ice axe, an ice piton and a whistle should be carried on each sledge. These should be easily accessible and not packed away among the loads. Each party should carry a light-weight snatch block and a number of lengths of good-quality rope.

### *Rescue procedure*

As soon as possible a looped rope should be lowered to the victim. Even if he is in no danger of falling farther down the crevasse this can be fastened to his waist loop with a karabiner and will give him a much-needed sense of security while awaiting rescue. If the victim is injured, it will be necessary for one of the rescuers to descend the crevasse to help him. Before anyone descends it is essential to organize the mechanics of lifting and lowering. Knots and anchorages should be checked, the rope untangled and laid out in orderly bights on the snow. Whistle signals should be rehearsed, remembering that they must be very simple: no more than "up", "down", and "stop". A snatch block should always be used if possible or, failing that, karabiners.[1] A direct pull is seldom successful for a variety of reasons. A chest loop should only be used if the haul is short and the way up clear and simple; otherwise ribs are easily broken and suffocation may result. The rope should always be arranged so that the weight is taken on the thighs, and the body is held upright even if unconscious. Hoar crystals on the walls of a crevasse can be sharp, and the victim may need to be protected against abrasion. The rescuer in the crevasse must realize that if the pulling power at the surface is limited he must provide frequent rests, and keep the surface party informed of progress whenever possible.

[1] Nylon rope should never be allowed to rub against other nylon rope, because the friction causes damage.

# FIELD WORK

## SOVIET HIGH LATITUDE OCEANOGRAPHICAL EXPEDITION, 1956

[From articles in *Vodnyy Transport* [*Water Transport*], 30 August, 27 and 29 September 1956; and *Ymer*, Årg. 77, Hft. 1, 1957, p. 19–38.]

An expedition, led by L. L. Balakshin of Arkticheskiy Nauchno-Issledovatel'skiy Institut [Arctic Research Institute], Leningrad, carried out oceanographical work aboard the ice-strengthened ship *Ob'* in the Greenland Sea, continuing the work done the previous summer by a party under the same leader in *Fedor Litke*. The scientific staff numbered forty-four and included twelve women. Three Scandinavian scientists, who are planning an International Geophysical Year expedition to Svalbard, were invited to accompany the ship: they were two Swedes, Valter Schytt (glaciologist) and Erik Eriksson (meteorologist), and one Norwegian, Nils Jörgen Schumacher (meteorologist).

The ship collected the Scandinavians at Stockholm on 8 August, and, after delivering some equipment at Barentsburg, went into the Greenland Sea. During the voyage fifty-eight oceanographical stations were worked, with the main object of studying heat exchange between Atlantic and Arctic Ocean waters. Bottom samples were also taken, and ice and weather records kept.

On 7 September the ship was off Nordaustlandet, and Balakshin, the three Scandinavians and L. Petrov flew in the ship's helicopter to a position on the ice sheet to reconnoitre a site for the next year's operations. Bad weather prevented the expected return of the helicopter two days later; it crashed on a rescue attempt shortly afterwards, and its crew were rescued by a party from the ship. A fixed-wing aircraft was flown especially up from Moscow, and this brought Balakshin's party safely out to the airstrip at Nagurskaya in Zemlya Frantsa-Iosifa on 21 September, where the ship picked them up three days later.

It had originally been hoped that the ship might be able to evacuate the Soviet drifting station SP-5, but this did not prove possible. *Ob'* returned to Gothenburg on 29 September, and after leaving the Scandinavians, continued to the U.S.S.R.

## SOVIET DRIFTING STATIONS IN THE ARCTIC OCEAN, 1956–57

[From *Vodnyy Transport* [*Water Transport*], 28 March 1957, and Moscow Radio, 16 March and 22 April 1957.]

Since the autumn of 1956[1] there have been several changes in the drifting stations.

SP-4 continued to drift along a course similar to that followed by SP-3 two years earlier, and was evacuated by air on 20 April 1957, when it was within about 300 km. of the north coast of Greenland. The camp was thus continuously occupied for three years, and had drifted over 6800 km.

SP-5, which it had been hoped might be relieved by *Ob'* in September 1956, was evacuated by air on 11 October. Its course for the last month of drift is not known.

SP-6 has drifted tortuously in the same general region throughout its first year. It was relieved on 20 April 1957, the new leader being V. M. Driatskiy. This station was said to be established on an ice island; recent reports, however, give the ice

[1] *Polar Record*, Vol. 8, No. 55, 1957, p. 350–51.

thickness as about 10 to 12 m., and this shows that the ice island (if indeed the term can be properly used) is much smaller than, for instance, T-3.

SP-7, a new station, was set up on 26 April, with V. A. Vedernikov as leader. The exact position is not known, but the intention was to establish the station in the region of lat. 82° N., long. 165° W., which is roughly where SP-2 was evacuated in 1951. SP-6 and SP-7 will thus be the two stations promised as part of the Soviet contribution to the International Geophysical Year.

The scientific programme has remained substantially the same. The new parties are rather smaller than their predecessors because more automatic recording apparatus is being used. Besides the drifting stations, it is intended to put out fifteen automatic weather stations on the ice of the Arctic Ocean in the summer of 1957.

## HELICOPTER OPERATIONS IN EAST GREENLAND, 1956

[From information provided by Autair Ltd., London.]

Between 5 July and 5 September 1956 two helicopters, belonging to Autair Ltd., carried out an extensive programme of flying in the area around Mesters Vig, in east Greenland. They were under contract to Nordisk Mineselskab A/S, of København, who have been opening up lead mines at Mesters Vig for some years. The aircraft used were "Sikorsky S-51s". They were transported to Mesters Vig from England in "Bristol Freighters", which made the journey with one stop, in Iceland. At the end of the season they were brought back from Greenland in *Kista Dan*. The party consisted of L. R. Lord, G. Jacques and J. Patcha, pilots, T. Hawie, engineer, and three mechanics.

Weather conditions were generally good and 205 flying hours were recorded. The main work consisted of transporting prospectors, equipment and supplies from Mesters Vig to camps in Skeldal, the valley of Schucherts Flod and other sites in the area. Reconnaissance flights were also made around Fleming Fjord.

## TRANS-ARCTIC COMMERCIAL FLIGHTS, 1954–57

[From *Polarboken*, 1954, p. 71–96, *Aftenposten*, 18–20 February 1957, *Aftonbladet*, 25 May 1954, *Dagens Nyheter*, 6 February 1955–27 February 1957, *Times*, 16 November 1956–27 February 1957.]

The first regular commercial air route over the North Pole to Japan was started on 24 February 1957 by Scandinavian Airlines System. Previously, however, a number of training and charter flights had been made via the North Pole by the same company. The first flight was made by the DC6B *Leif Viking*, commanded by Mikael Aschim, which carried thirty-five men from Oslo to Tokyo at the end of May 1954 to serve in the Norwegian field hospital in Korea. In May 1955 *Erik Viking*, captained by Göran Lind, took the Scandinavian delegation to the Congress of the International Chamber of Commerce in Tokyo by the North Pole route. When the seventh of the company's new DC7C aircraft was delivered in October 1956, it flew from the Douglas factory airfield at Santa Monica, California, to Anchorage, and then non-stop to Stockholm via the North Pole, a distance of 6600 km. (4103 miles), in 13 hr. 10 min. It was commanded by Mikael Aschim. In November 1956 five DC7C's and a DC6B carried over 400 members of teams taking part in the Olympic Games from Stockholm to Melbourne, by way of the North Pole to Anchorage, and thence via Honolulu and the Fiji Islands.

On 16 February 1957 the Global Express DC7C *Reidar Viking*, with Mikael Aschim again in command, took off at 12.20 G.M.T. from Stockholm with a team of Swedish and Norwegian geophysicists, led by Dr Arne Sandström (Uppsala), on board. Continuous measurements of cosmic ray intensity were made by these

The heavy lines show the course of the six Soviet drifting stations.

scientists during the course of the flight to Tokyo across the Arctic. The results were required in connexion with the opening of the International Geophysical Year. After fuelling at Luleå, the North Pole was passed at 21.50 G.M.T.; a landing was made at Fairbanks, and Anchorage was reached at 21.35 local time, after 15 hr. 35 min. flying time. *Reidar Viking* landed at Tokyo at 14.15 G.M.T. on 19 February, after a stop at Shemya in the Aleutians, and a total flying time of 29 hr. 6 min.

Five days later *Reidar Viking*, this time captained by Göran Lind, was one of the two Scandinavian Airways System aircraft which inaugurated the regular commercial polar flights between København and Tokyo, with one stop at Anchorage. *Reidar Viking* left Tokyo at 1.14 G.M.T. on 24 February. Prince Takahito Mikasa, youngest brother of the Emperor of Japan, and his wife, were among the forty-five passengers. On the same day the other Global Express DC7C, *Guttorm Viking*, commanded by Aage Hedall-Hansen, took off from Kastrup airport, København, at 11.35 G.M.T. This was later than *Reidar Viking* left Tokyo, since the latter had farther to fly before reaching the North Pole, where the two aircraft were scheduled to meet at 21.30 G.M.T. Among the forty-seven passengers on *Guttorm Viking* were Prince Axel of Denmark, H. C. Hansen (Prime Minister of Denmark), Halvard Lange (Foreign Minister of Norway), Ingvar Lindell (Swedish Minister without Portfolio), Hjalmar Riiser-Larsen (who made the first crossing of the Arctic with Amundsen in the airship *Norge* in 1926), and Per M. Hansson (Chairman of Scandinavian Airlines System).

*Guttorm Viking* covered the 3700 km. (2300 miles) to the North Pole in about 10 hr., arriving about 10 min. ahead of schedule. The Prime Minister of Denmark delivered a broadcast in English which was relayed to many countries, and he released a canister containing newspapers, the United Nations flag and the text of his speech. Flying at 3000 m. *Guttorm Viking* met *Reidar Viking*, which was flying 900 m. higher, at 21.37 G.M.T. Radio greetings were exchanged. Powerful head winds delayed *Reidar Viking* over Spitsbergen, and an unscheduled landing had to be made at Oslo to ensure that the aircraft retained the regulation margin of fuel. It landed at København at 8.45 G.M.T. on 25 February, 1 hr. and 29 min. late. *Guttorm Viking* covered the 7258 km. (4507 miles) from København to Anchorage in 17½ hr., stopped at Anchorage for 4 hr., and continued the 5950 km. (3695 miles) to Tokyo, in about 14 hr., landing at 23.15 G.M.T. on 25 February some 15 min. ahead of schedule.

The new Arctic route is only 13,235 km. (8202 miles) long, as compared with the 16,629 km. (10,326 miles) of the route from København to Tokyo via Karachi and Calcutta. The saving in time is some 20 hr. The 1957 summer schedules for the new route give a flying time of 30 hr. 30 min. for the flight from København to Tokyo, and 29 hr. 5 min. for the flight in the opposite direction. To this must be added the stop of 1 hr. at Anchorage in both cases. There will be two flights weekly in each direction. Emergency airfields are available at Nord, Thule and Resolute during the Arctic stage of the flights, and at Cold Bay, Shemya and Adek between Anchorage and Tokyo.

## ARGENTINE ANTARCTIC EXPEDITIONS, 1954–56

[The following notes have been prepared by Ena Thomas and are restricted to a description of the expeditions without reference to political implications. The information has been extracted from press and radio reports, and from an article by E. L. Diaz in *Anales de la Sociedad Cientifica Argentina*, Tomo 162, E iii y iv, 1956, p. 63–88. The last report on Argentine Antarctic expeditions (1951–54) was given in the *Polar Record*, Vol. 8, No. 53, 1956, p. 160–68. The Weddell Sea cruise of the Argentine icebreaker *General San Martín* in 1954–55 was described in the *Polar Record*, Vol. 8, No. 55, 1957, p. 351–54.]

### *Argentine Antarctic Expedition*, 1954–55

In 1954–55 the Argentine Government sent its annual expedition to the Antarctic under the command of Capitán de Navío Alicio E. Ogara.

In addition to the icebreaker *General San Martín*, six ships took part in the operations. They were the transports *Bahía Aguirre*, Capitán de Fragata Benigno C. Varela, and *Bahía Buen Suceso*, Capitán de Fragata Aurelio C. Lopez de Bertodano, the tanker *Punta Loyola*, Capitán de Corbeta Jorge Federico Pablo Wicht, and the ocean-going tugs *Sanavirón*, Capitán de Corbeta Hector A. Suffern Moine, *Chiriguano*, Capitán de Corbeta Adolfo V. R. Bluthgen, and *Yamana*, Capitán de Corbeta Antonio Revuelto.

The ships left Buenos Aires in mid-November 1954 and did not finally return until the end of March 1955. Their main task was the relief of the occupied stations on Laurie Island in the South Orkney Islands, Half Moon Island and Deception Island in the South Shetland Islands, Hope Bay on Trinity Peninsula, Gamma Island in the Palmer Archipelago, and Paradise Harbour and Barry Island on the west coast of Graham Land. In addition, seven existing refuge huts were occupied for the summer season. These were at Potter Cove on King George Island, Harmony Cove on Nelson Island, Telefon Bay and Pendulum Cove on Deception Island, Welchness on Dundee Island, and Brialmont Cove and Neko Harbour on the Danco Coast. Potter Cove was used during the early part of the season as a base for aircraft. These were transferred to Deception Island on 16 January 1955. Four new refuge huts were established at Ardley Peninsula on King George Island, Mikkelsen Harbour on Trinity Island, Dorian Bay on Wiencke Island, and Petermann Island in the Dannebrog Islands. All but the Dorian Bay hut were temporarily occupied during the summer.

During the season, existing light and navigation beacons were serviced; a new light was established on Farewell Rock off Trinity Island; the existing navigation beacon on Useful Islet in Gerlache Strait was replaced by a light; and new navigation beacons were built at Scotia Bay on Laurie Island, in the Flandres Bay area of the Danco Coast, and on Quintana Islets off the Graham Coast.

The transport ships carried "Grumman Goose" amphibian aircraft, and "Sikorsky" helicopters. These were used extensively throughout the season for ice and photographic reconnaissance, and for the relief of the Barry Island station. In November and December 1954 "Lincoln" and "Lancaster" aircraft made a number of non-stop return flights from Rio Gallegos over Deception Island and the Melchior Islands. During December 1954 and January 1955, helicopters operating from *Bahía Buen Suceso* are reported to have photographed the South Sandwich Islands from the air.

In late January and early February 1955, Almirante Juan José Janregui, the so-called "Maritime Governor of the Southern Sector", made a tour of some of the Argentine stations. He was accompanied by a senior officer of the United States naval mission in Buenos Aires.

During the winter of 1955, parties from the Argentine army detachment at Hope Bay established three additional refuge huts. The first, only 1500 yards east of the British hut at View Point in Duse Bay, was completed on 1 June; another, on Summit Pass in Tabarin Peninsula, on 20 June; the third, on Persson Island off western James Ross Island, on 19 August. Another refuge hut was established by the Barry Island army detachment on 4 November on Northeast Glacier. This hut is on the route across the plateau between Debenham Islands and the east coast of Graham Land. It was reported that cosmic-ray observations were made at Gamma Island in the Melchior Islands, and at "General Belgrano", the station on the Filchner Ice Shelf, during the winter.

The latter station was equipped with aircraft, "weasels" (tracked vehicles) and dogs, and in November 1955 a party led by General Pujato with five "weasels" made a reconnaissance southward from the station. The party was away for at least a month.

### *Argentine Antarctic Expedition*, 1955–56

President Perón's regime was overthrown by the revolution of September 1955. and a provisional government was established in Argentina. The Argentine Navy was much pre-occupied with internal affairs during the following months, and the annual relief expedition which visited the Antarctic in 1955–56 was mainly confined to the routine task of relieving the eight occupied stations. The expedition was under the command of Capitán de Navío Emilio L. Diaz, with Capitán Pisani Reilly as his Chief of Staff.

The task-force included the following units: the icebreaker *General San Martín*, Capitán de Fragata Luis M. Iriart; a transport *Bahía Aguirre*, Capitán de Fragata David O. Funcia; a survey ship *Chiriguano*, Capitán de Corbeta Juan C. Kelly; and a tanker *Punta Ninfas*. Air support consisted of a "Catalina", a "Grumman Goose" and two Sikorsky S-55 helicopters under the command of Capitán de Corbeta J. Martínez Achaval. There was a joint scientific commission of the Dirección General de Navegación e Hidrografía, the Instituto Antártico Argentino and the Instituto Geográfico Militar. Two United States scientists, Mr Manning of the University of Columbia and Dr Reidel of the Scripps Institution of Oceanography, joined *General San Martín* in February.

*General San Martín* left Buenos Aires on 23 November 1955. After relieving the station at Hope Bay, and landing two amateur radio enthusiasts at Thule Island, she relieved "General Belgrano" on the Filchner Ice Shelf at the end of December. General Pujato, who had been head of the Instituto Antártico Argentino, but had resigned just before the revolution, remained for a second year in command of this station. A number of his staff were changed. Oceanographical, glaciological and magnetic observations were made from the *General San Martín* and the helicopters were used for transporting personnel and in scientific work.

The second task of the icebreaker was the relief of the Barry Island station in Marguerite Bay. This was achieved early in February. After making further oceanographical observations in the Biscoe Islands and Gerlache Strait, *General San Martín* returned to Buenos Aires on 10 March.

*Bahía Aguirre* and *Chiriguano* left Buenos Aires on 1 December 1955 to relieve the northern stations. They also established temporary summer parties at seven existing refuge huts—at Thule Island in the South Sandwich Islands, Potter Cove and Ardley Peninsula on King George Island, Telefon Bay and Pendulum Cove on Deception Island, Welchness on Dundee Island, and Brialmont Cove on the Danco Coast. At the Brialmont Cove hut some biological work was carried out. The Thule Island hut was evacuated prematurely because of volcanic activity on nearby Bristol Island.

A new refuge hut and a navigation beacon were established during the summer on Watkins Island in the Biscoe Islands; existing light and navigation beacons were serviced; and new navigation beacons were built in the vicinity of the huts at Thule Island, Potter Cove, Hope Bay, Melchior Islands and "General Belgrano". A navigation beacon is also reported to have been erected on Elephant Island in the South Shetland Islands.

In January–February 1956, a party of visitors which included the Chilean Naval Attaché in Buenos Aires, the United States Assistant Naval Attaché and three members of the United States naval mission in Buenos Aires, joined *Bahía Aguirre* for a tour of the northern Argentine stations. A commission of Argentine radio technicians also visited the stations during the summer to inspect radio installations.

*Bahía Aguirre* and *Chiriguano* finally returned to Buenos Aires on 11 March 1956. The ships were already nearing their destination when, on 9 March, an Argentine rating from the Hope Bay station was reported to be adrift in a small boat. The unsuccessful search for this man by British ships and aircraft is described on p. 526.

During the early part of 1956, an air reconnaissance was made over the Filchner Ice Shelf from "General Belgrano" by two small army aircraft, one of which was piloted by General Pujato. They travelled southwards, and are reported to have reached lat. 83° S. before turning back. There have been many rumours that an attempt would be made to cross the continent from this station, and the ground and air reconnaissances were carried out with a view to establishing a route inland. Up to the present time, however, no such attempt has been made.

During the winter of 1956 further sledging activities were reported from Hope Bay and Barry Island. A number of journeys were made to Crown Prince Gustav Channel and James Ross Island by members of the army detachment at the former station, and in October one of these parties established a refuge hut on Robertson Island off the Nordenskjöld Coast of east Graham Land. In November and December, two further huts were established by parties from Barry Island on the route across the plateau between Debenham Islands and the east coast of Graham Land. One is understood to be on the plateau near the head of Bills Gulch, and the second near the junction of Bills Gulch and Trail Inlet. With the hut on Northeast Glacier built during 1955, there are now three useful refuges available to parties crossing to the Weddell Sea coast from Marguerite Bay.

## CHILEAN ANTARCTIC EXPEDITIONS, 1955–56

[The following notes have been prepared by Ena Thomas and are restricted to a description of the expedition without reference to political implications. The information has been extracted from press and radio reports. For the political aspects of this period see the *Polar Record*, Vol. 8, No. 56, 1957, p. 461–64. The last report on Chilean activities (1952–55) was given in the *Polar Record*, Vol. 8, No. 53, 1956, p. 169–72.]

In November 1955, the Chilean Government despatched their tenth expedition to the Antarctic. This expedition, which was under the command of Capitán de Navío Alfredo Martín Díaz, had as its main objective the relief of the existing stations at Discovery Bay on Greenwich Island, at Pendulum Cove on Deception Island, at Cape Legoupil on Trinity Peninsula, and at Paradise Harbour on the Danco Coast. It was also to enlarge these stations in preparation for the International Geophysical Year, and to make hydrographic and meteorological observations.

The ships taking part were the frigate *Baquedano*, Capitán de Fragata Wilfredo Bravo, the tanker *Rancagua*, Capitán de Fragata Juan Otazo Kelly, and the patrol boats *Lientur* and *Leucotón*. *Rancagua* carried a "Beaver" monoplane, fitted with floats, and a Bell type 47D helicopter.

The ships left Valparaiso about 23 November 1955, and reached Punta Arenas about 1 December. They arrived at Deception Island on the 9th or 10th, and at once began the task of relieving the stations. *Leucotón* visited Paradise Harbour and Cape Legoupil. *Lientur* appears to have been responsible for the relief of Discovery Bay. *Baquedano* and *Rancagua* returned to Punta Arenas on 23 December with the 1955 wintering parties. A "Catilina" of the Chilean Air Force flew from Punta Arenas to Deception Island and back at the end of December.

Early in January 1956, *Baquedano* returned to Deception Island, sailing again on the 15th for Peter I Øy. The island was reached on the 18th and it is reported that a landing was made in Sandefjordbukta on the west coast.

Early in February a new refuge hut was built on the north side of Port Foster, Deception Island, not far from the Chilean station at Pendulum Cove. On 7 February *Leucotón* visited Stonington Island in Marguerite Bay and built a new refuge hut near the existing British and American unoccupied stations.

During the season, Chilean ships visited the British stations at Admiralty Bay and Port Lockroy. They had all returned to Punta Arenas by mid-February.

## THE FALKLAND ISLANDS DEPENDENCIES SURVEY, 1955–56

[Summarized from information provided by the Colonial Office. An account of the Falkland Islands Dependencies Survey (F.I.D.S.) activities in 1954–55 was published in the *Polar Record*, Vol. 8, No. 54, 1956, p. 260–64. The concurrent activities of the Falkland Islands Dependencies Air Survey Expedition, an integral part of F.I.D.S. during the 1955–56 summer season, were described in the *Polar Record*, Vol. 8, No. 54, 1956, p. 237–45. The R.R.S. *John Biscoe* referred to below is the predecessor of the present R.R.S. *John Biscoe*. The latter was commissioned for the 1956–57 season. In April 1956 the old *John Biscoe* reverted to her earlier name of *Pretext*. She was later purchased by the New Zealand Ross Sea Committee for use by the Trans-Antarctic Expedition, and has been re-named H.M.N.Z.S. *Endeavour*.]

During the winter of 1955, eight British stations were occupied by F.I.D.S. parties: Signy Island in the South Orkney Islands; Whalers Bay, Deception Island, and Admiralty Bay, King George Island—both in the South Shetland Islands; Hope Bay, Trinity Peninsula; Port Lockroy, Wiencke Island; a new station on the west coast of Anvers Island; the Argentine Islands; and Horseshoe Island—the last four off west Graham Land.

*Relief of F.I.D.S. stations*, 1955–56. R.R.S. *John Biscoe*, Captain N. R. Brown, left Southampton on 12 October 1955, carrying relief parties, stores and equipment. She arrived at Port Stanley, Falkland Islands, on 27 November, and left on her first southern voyage on 5 December. Between 9 and 21 December the ship visited South Georgia, and called at the British stations at Signy Island, Hope Bay, Deception Island, Port Lockroy, Anvers Island, the Argentine Islands and Admiralty Bay. At each of these stations preliminary staff changes were made and stores and mail were landed. Further calls were then made at Hope Bay and Signy Island. On 8 January 1956 a survey party from the Signy Island station was landed at Cape Meier on Coronation Island. Leith Harbour and Grytviken in South Georgia were again visited on 12 and 13 January. The ship returned to Port Stanley on the 18th.

Meanwhile, on 29 December 1955, R.R.S. *Shackleton*, Captain W. Johnston, left Southampton for the Falkland Islands, reaching Port Stanley on 31 January 1956. She left on her southern voyage on 14 February, carrying further relief parties and stores. She visited Admiralty Bay on 17 February and then searched Brabant Island and the Danco Coast of Graham Land for a site for a new station. With the help of helicopters from H.M.S. *Protector*, a site was eventually chosen on an island in the channel between Rongé Island and the Danco Coast. The work of building the new station began on 2 March. The Argentine Islands were visited on 7 March; Horseshoe Island was relieved between 11 and 18 March; the Stonington Island station, which had been evacuated in February 1950, was examined; the Argentine Islands were again visited on 24 March; and Port Lockroy on the 25th. At Port Lockroy, V. A. Harrison, officer in charge of the ionospheric station in Stanley, overhauled ionospheric equipment. The ship returned to the new Danco Coast station until 31 March, when she sailed for Deception Island. Between 2 and 5 April, working parties from the ship helped to build a new hut at Admiralty Bay. The ship returned to Port Stanley on 8 April.

The second southern voyage of *John Biscoe* began on 7 February. She went first to Admiralty Bay and twice visited Hope Bay on her way to and from the hut at View Point in Duse Bay. She called at Deception Island, and the Argentine Islands, and then sailed for the Loubet Coast of Graham Land. This coast was searched for a site for a second new station. On 24 February the station was established on Anvers Island, one of a group of islets about 10 miles from Cape Rey in the entrance to Lallemand Fjord. The ship remained there for some days while the hut was built and then went to the Argentine Islands and Port Lockroy.

On 9 March a rating from the Argentine naval station at Hope Bay was reported

adrift in a small boat. *John Biscoe* sailed at once for the area, where she was joined by two "Canso" flying boats belonging to the Falkland Islands Dependencies Air Survey Expedition, and by H.M.S. *Protector*, with two helicopters. An extensive air and sea search was made for the missing man on the 10th, but he was not found.

The Governor of the Falkland Islands and Dependencies joined *John Biscoe* at Hope Bay in order to tour F.I.D.S. stations. Between 12 and 30 March Horseshoe Island, Hope Bay, Admiralty Bay and Signy Island were visited. On 29 March the survey party was collected from Coronation Island and returned to Signy Island. A call was made at South Georgia on 2 and 3 April and the ship returned to Port Stanley on 6 April.

During the summer season, J. A. Heap of the Falkland Islands Dependencies Scientific Bureau accompanied *John Biscoe* to study sea ice conditions in the waters of the Falkland Islands Dependencies. His aim was to gain a mental picture of Graham Land and of the hydrography of the region in relation to the formation and dispersal of sea ice, and to gain experience of sea ice and of the navigation of ships in ice. The second aim was unsuccessful because the 1955–56 summer season was a particularly open one and little sea ice was encountered.

At the end of the season *Shackleton* left Port Stanley on 24 April and reached England on 25 May. *John Biscoe* (now renamed *Pretext*) left Port Stanley on 2 May. She called at South Georgia before returning to England. She finally reached Southampton early in June.

*Visit of British naval guardship*, 1955–56. The armed netlayer H.M.S. *Protector*, Captain J. V. Wilkinson, R.N., left Portsmouth on 3 October 1955 and reached Port Stanley, Falkland Islands, at the beginning of November. She took the place of the naval frigates which had acted as guardships in the Falkland Islands and Dependencies during previous summer seasons. She was equipped with two "Sikorsky" helicopters, and carried a detachment of Royal Marines.

*Protector* left on her first southern voyage on 14 November 1955. She reached South Georgia on the 17th. On the 21st she sailed southwards to reconnoitre the northern limit of the Weddell Sea pack ice, returning to Signy Island on the 26th, and Port Stanley on the 28th.

*Protector* left again on her second southern voyage on 13 December, reaching Deception Island on the 16th with stores and equipment for the British station. The Argentine and Chilean stations and refuge huts and a Chilean ship were visited. She returned to Port Stanley on the 19th.

On 11 January 1956 *Protector* began her third southern voyage. She reached Deception Island on the 14th and again visited Argentine and Chilean stations, refuges and ships. She sailed the same day for the Bellingshausen Sea, via Schollaert and Neumayer Channels, to meet the British floating factory *Southern Harvester*. On the 17th she refuelled from the factory ship, and course was then set for the Weddell Sea. While in Bransfield Strait, British stations on Deception Island and at Admiralty Bay and the Argentine establishment at Potter Cove, King George Island, were visited by helicopter. On 23 January the ice edge in the Weddell Sea was located in about lat. 66° 45′ S., long. 32° W., and three reconnaissance flights were made by the helicopters in order to locate the Trans-Antarctic Expedition ship *Theron*, which was at that time beset on her way to Vahsel Bay, and to provide her with ice reports. *Protector* returned to Montevideo on 1 February and to Port Stanley on the 11th.

She left again on her fourth southern voyage on 13 February. While in the vicinity of Deception Island on the 16th, a visit was made by helicopter to the Argentine station on Half Moon Island, off Livingston Island. On the 17th, three officers and sixteen marines were landed by helicopter near Mount William on southern Anvers Island for a week's training ashore. On the same day *Protector's* helicopters visited the

new British station on Anvers Island and the Chilean station in Paradise Harbour, while the motor cutter went to Port Lockroy and the Argentine station in Paradise Harbour. On 18 February a helicopter flew to the Chilean station at Cape Legoupil, Trinity Peninsula. *Protector* visited Deception Island between 20 and 22 February, and on the 23rd she returned to Anvers Island to fly out the Royal Marine party. Her helicopters also assisted *Shackleton* in the search for the new station site on the Danco Coast. On 24 February the Argentine station on Gamma Island in the Melchior Islands was visited. After again refuelling from *Southern Harvester* in the Bellingshausen Sea, *Protector* returned to Port Stanley on 2 March.

She left on her final southern voyage, with the Governor on board, on 7 March. On the 10th she assisted in the search for the Argentine missing from Hope Bay. On the 11th the Governor transferred to *John Biscoe*, and *Protector* visited Deception Island. She sailed the same day for the South Sandwich Islands, calling on her way at Signy Island on the 13th. On the 15th, Southern Thule was sighted, but bad weather stopped flying until the 17th, when the Argentine hut on Thule Island was inspected, and the helicopters took photographs of Bristol, Montague and Saunders Islands. On the 18th a landing was made on Saunders Island, and on the 19th the Candlemas Islands and Zavodovski Island were examined from the sea and Visokoi Island was photographed from the air. A helicopter made the first landing on Visokoi Island. On the evening of the 19th course was set for Port Stanley via South Georgia.

*Protector* returned to Portsmouth on 22 May.

*Activities at F.I.D.S. stations*, 1956. Routine meteorological observations were continued throughout the year from the occupied stations at Signy Island, Deception Island, Admiralty Bay, Hope Bay and Horseshoe Island. Ionospheric work was carried out at Port Lockroy, and radio-sonde observations in the Argentine Islands. Routine weather forecasts were made from Grytviken in South Georgia and special weather forecasts were provided for the whaling fleets between 21 December 1955 and 11 March 1956. The new station in Lallemand Fjord began routine meteorological observations in May.

A number of survey and geological journeys were made on Coronation Island by members of the Signy Island station. On 8 January 1956, J. F. D. Bridger, P. A. Cordall (a member of the 1955 wintering party), A. Grant and D. H. Matthews were landed by *John Biscoe* at Cape Meier near the south-western extremity of Coronation Island. During January and February the survey of the west coast between Cheal Point and Penguin Point was completed. The hut in Sandefjord Bay was visited and reported to be a total wreck. During March the survey was extended inland to Deacon Hill, but the party was unable to travel farther east and therefore returned to Signy Island on the 29th. Between 16 and 30 April a depot was laid at Olivine Point on the south coast of Coronation Island, and early in May an unsuccessful attempt was made to reach the interior of the island by way of Sunshine Glacier and High Stile. Between 16 and 31 May a geological reconnaissance was made between High Stile, Shingle Cove and Coldblow Col. On 10 July, Bridger, Matthews and W. L. N. Tickell began their main winter survey and geological programme from Shingle Cove. Grant joined the party on 6 September, and on the 11th he and Tickell climbed Mount Nivea, about 4180 ft. high, the highest mountain on Coronation Island. Meanwhile Bridger and Matthews were surveying in the vicinity of Ommanney Bay. The whole party was back on Signy Island by early October. Towards the end of November, *Shackleton* landed a party on the east coast of Coronation Island in order to complete the survey. A start was also made during the year on the geological survey of Signy Island.

During the latter part of 1956, a number of sledge journeys were made from Hope Bay. The View Point hut was almost continuously occupied, and the local survey

of that area, begun in March, was later extended to join the local survey of Hope Bay made by R. R. Kenney in 1954–56.[1] Early in June, W. W. Herbert, W. A. G. Nicholls, H. W. Simpson and R. F. Worswick left Hope Bay on a depot-laying journey to Cape Longing. They also planned to complete the survey in the vicinity of Cape Sobral, but were turned back by open water in Crown Prince Gustav Channel. During the first half of July, Herbert, Simpson, R. I. Walcott and Worswick visited Cape Legoupil, on the north coast of Trinity Peninsula. There they obtained an astronomical fix and amended the existing survey detail of the area. They returned to View Point on 19 July. On 23 and 24 July, L. Catherall, Herbert, Simpson and Worswick again tried to reach Cape Longing without success. A depot was laid on James Ross Island. Finally, between 4 and 23 September, Herbert and Worswick reached Cape Longing by way of James Ross Island. This overland route avoided the open water which still persisted in Crown Prince Gustav Channel. At the end of September, Catherall, G. M. Larmour and Simpson laid a further depot on James Ross Island.

In February 1956, a brief visit was made by members of the Port Lockroy station to nearby Doumer Island. In July a small refuge hut was erected on the island.

The survey and geological examination of Anvers Island continued throughout the year. During January 1956, L. V. Harlow, A. L. Shewry and J. W. Thompson worked in the Copper Peak area. Survey and geological work was also carried out in the vicinity of the new station and on the inshore islands along the south coast of Anvers Island. In March, P. R. Hooper, A. J. Rennie (a member of the 1955 wintering party) and Thompson worked in the Wauwermans Islands. Early in April, G. J. Bull, Harlow, Hooper and J. P. Wylie made a five-day boat trip to Cape Monaco, and in May and June the whole of the party wintering on Anvers Island worked on the survey of the west coast. In the second half of July, Hooper and D. Kershaw visited the glacier flowing into Lapeyrère Bay to make glaciological observations. Between 27 August and 19 September, Hooper and Harlow worked on the geology of the north-west coast of Anvers Island. Soon after their return to the station, Bull and Wylie, supported by Harlow and Kershaw, left for the same area to complete the survey. The support party returned on 10 October; the main party on 5 November. On 16 November, Bull, Hooper and Thompson visited the Copper Peak area, calling on the way at Port Lockroy. On the 25th, they were joined by Kershaw and Wylie. Mount Français, the highest mountain on Anvers Island, was again climbed,[2] this time by Bull and Hooper. The whole party had returned to the station by 4 December.

From the new station on Danco Coast, reconnaissance and survey of the mainland began as soon as the hut was completed. On 10 May, M. B. Bayly, L. Harris and J. Ketley left by boat to search for a possible route on to the central plateau of Graham Land. They searched the coast as far south as Paradise Harbour, but found no way in. A second unsuccessful reconnaissance was made to the east in late May. On 5 July, Bayly, R. A. Foster, Harris and C. H. Palmer made a depot-laying journey to the mainland, and Bayly and Harris carried out some geological work. These two accompanied Foster and F. E. Wooden on a further unsuccessful reconnaissance for a route to the plateau in mid-August, returning on 9 September. Foster and Wooden stayed on the mainland doing survey work until 3 October. Rongé Island and Cape Anna were visited in October and November. On 7 December, *Shackleton* took a party of seven to Cape Reclus in a further attempt to find a route up to the plateau. A small hut on Cape Reclus was completed on 25 December. A route to the plateau from this hut was subsequently found in February 1957. A local survey of the area around the new station was made during 1956.

[1] See the *Polar Record*, Vol. 8, No. 54, 1956, p. 262, as amended by No. 55, 1957, p. 408.
[2] For first ascent, see the *Polar Record*, Vol. 8, No. 54, 1956, p. 262.

Local survey and geological work began at the second new station in July 1956. In August, a depot was established on the east coast of Lallemand Fjord. This was reached by way of Adresen Island. Some survey was carried out and an unsuccessful attempt was made to find a route to the plateau. On 25 September, J. Thorne and H. G. Wright left for Hanusse Bay to do geological work. On 6 October they returned to Roux Island because of the break-up of the sea ice. Here they were joined by a relief party, R. Miller and D. P. Moore. Moore and Thorne returned to the hut on 4 November. Miller and Wright were unable to do so. They were eventually picked up by a helicopter from H.M.S. *Protector* on 10 November.

The activities at Horseshoe Island were hampered during much of the year by the unstable condition of the sea ice in Marguerite Bay, and much of the time was spent on local survey and geological work. In September, D. Atkinson, D. J. H. Searle and G. T. Vine-Lott, supported by M. Evans and J. A. Exley, made a man-hauling reconnaissance to the central Graham Land plateau through the north-eastern part of Square Bay and Forbes Glacier. Some geological work was carried out. On 10 October, Atkinson, Evans, Exley and Searle, with F. B. Ryan and C. D. Scotland in support, attempted to reach the Lallemand Fjord area in order to help the party on Roux Island. They reached Blaiklock Island, and Atkinson and Searle attempted to make a survey of Reid Glacier. Bad weather made progress impossible and the party was forced to return to Horseshoe Island. In November, a local survey was made of Lagotellerie Island.

## Appendix. *Wintering parties at F.I.D.S. stations*, 1956

*Port Lockroy, Wiencke Island, Palmer Archipelago* (*Base A*)

A. M. Carroll, Officer-in-charge and general assistant (ionospheric)
P. J. Bunch, Radio operator mechanic
D. R. H. Davis, Scientific assistant (ionospheric)
L. J. Fox, General Assistant (ionospheric)
B. L. Golborne, Diesel electric mechanic

*Deception Island, South Shetland Islands* (*Base B*)

P. Guyver, Officer-in-charge and diesel electric mechanic
J. W. Fellows, Meteorological assistant
J. Hill, Radio operator mechanic
C. Johnstone, Meteorological assistant
L. Maloney, Meteorological assistant
J. P. Smith, Meteorological assistant

*Hope Bay, Trinity Peninsula* (*Base D*)

R. F. Worswick, Officer-in-charge and meteorological assistant
L. Catherall, Meteorological assistant
D. A. Clarke, Diesel electric mechanic
W. W. Herbert, Assistant surveyor
K. V. Hill, Radio operator mechanic
G. M. Larmour, Meteorological assistant
J. S. Madell, Assistant surveyor
W. A. G. Nicholls, General assistant and mountaineer
J. R. Noble, Meteorological assistant
H. W. Simpson, Medical officer
P. B. Thompson, Meteorological assistant
R. I. Walcott, Meteorological assistant

*Argentine Islands, west Graham Land* (*Base F*)

N. A. Hedderley, Officer-in-charge and meteorological observer
O. Connochie, Radio operator mechanic
G. T. Cutland, General assistant (cook)
G. R. Ibbotson, Meteorological assistant
H. A. Imray, Medical officer
D. Macnab, Senior assistant (radio-sonde)
D. Skilling, Diesel electric mechanic
R. L. Tapp, Meteorological assistant
R. A. Todd-White, Meteorological assistant

*Admiralty Bay, King George Island, South Shetland Islands* (*Base G*)
C. C. Clement, Officer-in-charge and diesel electric mechanic
G. E. Broome, Meteorological assistant
D. K. Brown, Meteorological assistant
M. J. Royle, Radio operator mechanic
A. L. Shewry, General assistant
R. W. Tufft, Meteorological assistant

*Signy Island, South Orkney Islands* (*Base H*)
W. L. N. Tickell, Officer-in-charge and meteorological assistant
F. G. Axtell, Meteorological assistant
J. F. D. Bridger, Assistant surveyor
A. Grant, Diesel electric mechanic
A. B. Hall, Meteorological assistant
P. W. Mander, Meteorological assistant
D. H. Matthews, Geologist
S. M. Ward, Radio operator mechanic

*New station,* Anvers Island, Palmer Archipelago* (*Base N*)
P. R. Hooper, Officer-in-charge and geologist
G. J. Bull, Diesel electric mechanic
L. V. Harlow, General assistant and mountaineer
D. Kershaw, Assistant surveyor
J. W. Thompson, General assistant and mountaineer
J. P. Wylie, Assistant surveyor

*New station,* Danco Coast, west Graham Land* (*Base O*)
R. A. Foster, Officer-in-charge, general assistant and handyman
M. B. Bayly, Geologist
L. Harris, General assistant and carpenter
J. Ketley, Assistant surveyor
C. H. Palmer, Radio operator mechanic
F. E. Wooden, Assistant surveyor

*New station,* Loubet Coast, west Graham Land* (*Base W*)
T. L. Murphy, Officer-in-charge and assistant surveyor
R. E. Cooper, Diesel electric mechanic
R. Miller, General assistant and handyman
D. P. Moore, Radio operator mechanic
M. J. H. Orford, Assistant surveyor
E. M. P. Salmon, Meteorological assistant
J. Thorne, Meteorological observer
H. G. Wright, Geologist

*Horseshoe Island, Marguerite Bay, west Graham Land* (*Base Y*)
D. J. H. Searle, Officer-in-charge and surveyor
D. Atkinson, Diesel electric mechanic
D. Chalmers, Meteorological observer
C. G. Cumming, General assistant and handyman
A. K. Donnelly, Radio operator mechanic
M. Evans, Medical officer
J. A. Exley, Geologist
F. B. Ryan, Meteorological observer
C. D. Scotland, Meteorological observer
G. T. Vine-Lott, Meteorological assistant

* Place-names for these three stations have not yet received official approval.

## THE TRANS-ANTARCTIC EXPEDITION, 1955–58: OPERATIONS IN 1956–57

[By J. A. Heap. Previous accounts of the expedition have appeared in the *Polar Record*, Vol. 8, No. 53, 1956, p. 172; No. 54, 1956, p. 264–67 and No. 55, 1957, p. 356–57.]

*Magga Dan* left London on 15 November 1956 with the main parties of both the Trans-Antarctic and the Royal Society Antarctic Expeditions. On 13 November members of both parties had been presented to the Queen during an informal reception at Butler's Wharf. Her Majesty also inspected the ship. *Tottan*, which had been chartered by the Royal Society as a supplementary supply ship, sailed on 17 November.

*Magga Dan* reached South Georgia via Montevideo on 17 December, and three days were spent re-fuelling and fitting wings to the "Auster" aircraft so that she could carry out reconnaissance in the pack ice. Leaving South Georgia on 20 December, the vessel first encountered open pack ice twenty miles south of Southern Thule, in the South Sandwich Islands, on the 23rd. From there, a course was laid for a point forty miles to the west of Kap Norvegia, but relatively easy ice conditions led the ship on a more southerly course. The ice remained open until 28 December. An air reconnaissance on 30 December, after the vessel had been temporarily beset, showed difficult ice conditions to the south. A wide, semi-circular sweep was made to the north which, on 2 January 1957, brought the vessel to very close, heavy, pressure ice thirty-five miles north-west of Kap Norvegia. A reconnaissance by the "Auster" showed the way out for both *Magga Dan* and the nearby *Tottan* and both vessels reached the shore lead off Caird Coast on the morning of 3 January.

From 4 to 12 January *Magga Dan* discharged about 350 tons of stores at Halley Bay before sailing on to "Shackleton", which was reached on 13 January. With the assistance of the ten Royal Society men who had built the base at Halley Bay, and working long hours during the following fortnight, the whole base was built. This meant installing the interior fittings of the base hut, the main structure of which had been completed by the Advance Party, building temporary workshops for servicing vehicles and aircraft, an outside laboratory for seismic and meteorological work, and an emergency store. Before the ship left on 28 January sufficient seals had been killed to feed the dogs for the whole winter. The return voyage of *Magga Dan* was uneventful, and the only ice met was very open pack ice off Kap Norvegia.

Before, and since, the departure of the ship, reconnaissance of the route inland from "Shackleton", and for a site for "Depot 300" (now known as "South Ice"), was carried out by Fuchs with the "Otter" aircraft. By 25 April "South Ice" had been established by air and was manned by H. Lister, J. Stephenson and K. V. Blaiklock.

On the New Zealand side Sir Edmund Hillary left Wellington on 21 December in *Endeavour*, which reached Butter Point, with some assistance from the United States Navy icebreaker *Glacier*, on 5 January. Reconnaissance showed that the proposed base site at the foot of the Ferrar Glacier was impracticable so it was decided to build the base at Pram Point on Ross Island. In the meantime a sledge-party on the Ferrar Glacier reported that the glacier was impassable to vehicles, due to summer melting. Air reconnaissance by "Beaver" aircraft suggested that, apart from adding a further 150 miles to the crossing, the Skelton Glacier, leading down from the Polar Plateau to Skelton Inlet, was a better route. This route was further investigated by ground parties using dog teams with air support, and found to be satisfactory. A depot has been laid at the head of Skelton Glacier.

The New Zealanders are now to lay a further depot, in support of the Main Party, south of the final one originally planned at Mount Albert Markham.

"Shackleton" base with *Magga Dan* unloading, 1957

*Photograph by Trans-Antarctic Expedition*

(*Facing p.* 532)

(*Facing p.* 533)

## AUSTRALIAN NATIONAL ANTARCTIC RESEARCH EXPEDITION, 1956–57

[By P. G. Law. Previous accounts of the expeditions were given in the *Polar Record*, Vol. 5, No. 37/38, 1949, p. 317–23; Vol. 6, No. 41, 1951, p. 80–84; No. 45, 1953, p. 667–69; Vol. 7, No. 50, 1955, p. 400–02; No. 51, 1955, p. 497–98 and Vol. 8, No. 54, 1956, p. 258–59.]

### *Mawson*, 1956

During 1956 Mawson station was manned by a party of twenty men led by William Bewsher. Exploration at Mawson was placed on a new footing with the commencement of air operations. A unit of the R.A.A.F., under the command of Squadron Leader Douglas Leckie, was stationed there throughout the year and carried out flights, totalling 50,000 miles, in the expedition's "Beaver" aircraft. These flights included photo surveys and depot-laying sorties to assist ground parties. Approximately 25,000 lb. of food, fuel and equipment were flown into advanced bases in Amundsen Bay, King Edward VIII Gulf and the Prince Charles Mountains.

Three important discoveries were made from the air. They were a new and extensive group of mountains in Enderby Land, 300 miles south-west of Mawson, some major coastal modifications to existing maps in the region of Amundsen Bay, Enderby Land, and a huge glacier 300 miles south-east of Mawson. This glacier, which feeds the Amery Ice Shelf in Prydz Bay, is over 150 miles long.

The work of field parties on the ground was continued. Parties landed by aircraft at the advanced depots carried out survey and geological work over the surrounding country. Journeys by "weasel" and dog sledge were made to the Masson Range and to Taylor Glacier.

On 19 November a party consisting of W. G. Bewsher, P. W. Crohn, L. G. Gardner, J. Hollingshead and S. L. Kirkby left Mawson with two "weasels" and one dog sledge on the main journey for the year—an inland survey trip to the Prince Charles Mountains. A depot had been established there by aircraft earlier in the year. This depot, which lay 250 miles south-east of Mawson and was known as "Aerial Depot", was reached on 12 December.

Fifteen miles beyond "Aerial Depot" travel by "weasel" had to be abandoned because of crevasses. From there, three separate dog-sledging journeys were made to explore the ranges to the south and south-east. In six weeks' reconnaissance by this means, over 350 miles of new territory was traversed.

The party left "Aerial Depot" on the return journey on 29 January 1957, reaching Mawson on 10 February after nearly 3 months in the field. The total distance covered during the journey was 800 miles. Scientific observations in meteorology, geology, glaciology, marine biology, cosmic rays, aurora, geomagnetism and seismology were successfully carried out during the year.

### *Establishment of Davis*, 1957

The 1957 relief expedition, led by Phillip Law, had two objectives—the relief of Mawson and the establishment of a new Australian station at the Vestfold Hills in Princess Elizabeth Land. The expedition left Melbourne on 17 December 1956 in *Kista Dan*. As heavy ice blocked the first attempt to approach Mawson, the expedition turned eastwards towards Vestfold Hills and penetrated the pack ice to reach Prydz Bay on 9 January 1957. After an intensive air and sea reconnaissance a site was selected for the new station and landing operations began on 12 January.

The Vestfold Hills region, which was previously explored by A.N.A.R.E. parties in 1954 and 1955, lies about 400 miles east of Mawson. It comprises 300 square miles of exposed rock, ice-free in summer, dissected by fjords and studded with lakes. On

13 January Law raised the flag at the new station (lat. 68° 34′ 30″ S., long. 77° 58′ 30″ E.) and formally named it "Davis" after Captain John King Davis, the veteran Antarctic navigator. Within a week six huts were built, radio aerials were erected, electric power was being generated and the station was operational. *Kista Dan* sailed from Davis on 20 January.

The members of the five-man wintering party at Davis are:

W. R. J. Dingle, Officer-in-charge and meteorologist
A. C. Hawker, Radio supervisor
N. T. Lied, Radio officer
W. C. Lucas, Diesel mechanic
B. Stinear, Geologist

### *Relief of Mawson*, 1957

Before proceeding to Mawson, *Kista Dan* sailed to Vincennes Bay and picked up seven Australians and a United States observer from the United States icebreaker *Glacier*.

The ship reached Mawson on 2 February, remaining there fifteen days while the annual changeover took place. The members of the wintering party in 1957 are:

K. B. Mather, Officer-in-charge and physicist
R. Arnel, Radio officer
D. R. L. Callow, Physicist (auroral)
Flt. Lt. P. Clemence, Pilot, R.A.A.F.
N. C. Collins, Senior diesel mechanic
E. D. Field, Cook
M. M. Fisher, Surveyor
J. Goodspeed, Seismologist
F. T. Hannan, Meteorologist
B. Izabelle, Weather observer
Flt. Lt. P. Johnson, Pilot, R.A.A.F.
P. King, Radio officer
R. T. Lee, Diesel mechanic
M. Mellor, Glaciologist
Cpt. N. Meredith, Engine fitter, R.A.A.F.
C. S. Nilsson, Physicist (auroral)
Flt. Sgt. R. Pickering, Air Frame fitter, R.A.A.F.
J. Pinn, Physicist (cosmic ray)
A. H. Sandilands, Radio officer
B. Shaw, Radio supervisor
J. E. Shaw, Physicist (radio)
Dr R. L. Willing, Medical officer

*Kista Dan* left Mawson on 17 February, calling in to land further equipment at Davis before returning to Australia via Îles de Kerguelen.

New scientific equipment installed at Mawson in 1957 included an ionospheric sounder, equipment for radar tracking of meteor trails for upper wind determinations, all-sky auroral cameras, photo-theodolites for parallactic photography of the aurora, and a 12-counter cosmic ray neutron monitor, whose records will supplement those of the two large meson telescopes which have been operating for the last two years. A programme of glaciological work and seismic ice depth determinations has been introduced. The station now comprises twenty-seven buildings, including an aircraft hangar and an auroral observatory.

### *Relief of Macquarie Island*, 1957

The annual changeover at Macquarie Island was carried out in four days from 2 to 6 December 1956, by a relief expedition led by J. Donovan. The members of the wintering party in 1957 are:

H. P. Black, Officer-in-charge
N. M. Brice, Physicist (radio)
J. Cleary, Geophysicist
S. E. Csordas, Medical officer
J. V. Denholm, Physicist (auroral)
A. S. Flett, Radio officer
R. Hills, Weather observer
M. P. Hines, Biologist
T. M. Keddie, Radio officer
W. Kellas, Meteorologist
D. Lake, Cook
C. M. McKenzie, Diesel mechanic
C. J. McNaughton, Radio supervisor
P. Ruckert, Weather observer
W. J. Steuart, Physicist (cosmic ray)

New scientific equipment installed in 1957 included an automatic all-sky auroral camera, an ionospheric "whistler" recorder, a Dobson ozone spectro-photometer and a cubical cosmic ray meson telescope.

## INTERNATIONAL GEOPHYSICAL YEAR, 1957–58; ANTARCTICA, 1956–57

[Previous accounts of the activities of nations operating in Antarctica during the International Geophysical Year were published in the *Polar Record*, Vol. 8, No. 53, 1956, p. 182–87 and No. 55, 1957, p. 357–61. The map facing p. 541 is a revised version of the one illustrating planned stations in the first of these notes. Details of Argentine and Chilean activities are not yet available.]

### *Belgium*

It is planned that a Belgian expedition will establish an International Geophysical Year station at Breidvika (lat. 71° S., long. 20° E.) in Dronning Maud Land during the 1957–58 season. The expedition, consisting of about 15 men, will be led by G. de Gerlache and is to be equipped for inland travel. It will sail in *Polarhav*, a sealer now being built in Norway.

### *France*

The tractor train, which left "Base Dumont d'Urville" on 1 October 1956 to set up "Station Charcot", was immobilized for three weeks by a blizzard in December, and the new station was not established until January 1957. It is in lat. 69° 22′ S., long. 139° 02′ E., at an altitude of about 2378 m., about 320 km. south of "Base Dumont d'Urville". *Norsel*, with the expedition's main party under B. Imbert, arrived at Pointe Géologie on 22 December 1956, after an ice-free voyage. A Bell 47 G2 helicopter was carried. A mid-way depot of fuel and supplies on the way to "Station Charcot" was established by the helicopter during 167 hours of trouble-free flying. It was occupied for some time by G. Rouillon and G. de Gerlache, who is to lead the Belgian expedition to Dronning Maud Land in October 1957.

A tractor train took the wintering party of three, and further supplies, to "Station Charcot".

At "Base Dumont d'Urville" all scientific observations had been started by 15 March, and the first radio-sonde ascent was made on the 30th.

*Norsel* left "Base Dumont d'Urville" on 12 February and made hydrographic observations at six stations between lats. 64° and 61° S. She reached Le Havre on 30 April.

### *Japan*

*Soya* and *Umitaka Maru*, a naval training ship, reached Ongul Island in Lützow-Holmbukta, Prins Harald Kyst, on 29 January 1957. A site for the station, to be known as "Showa", was chosen about 15 miles from the anchorage, and unloading carried out by means of four snowmobiles. The ships left Ongul Island on 15 February and soon afterwards were beset in pack ice from which they were freed by the Soviet *Ob'* on 1 March. On 23 March a large quantity of food and fuel was carried out to sea during a storm and lost. The station was completed in February and is in twice-daily radio contact with Mawson. The summer party, who returned on *Soya* and *Umitaka*, were:

Y. Nagata, Leader
K. Aida, Ionosphere
M. Ase, Ionosphere
K. Inbe, Survey
M. Kodama, Cosmic ray
K. Kosunoki, Oceanography
Y. Kuga, Meteorology
S. Maruchi, Seismology
T. Matsumoto, Seismology
K. Momose, Geomagnetic studies
U. Morito, Meteorology
J. Nakamura, Aurora
T. Ogushi, Geomagnetic studies
H. Okamoto, Ionosphere
Z. Seino, Meteorology
N. Tajima, Meteorology
T. Tateishi, Seismology
H. Toya, Glaciology
T. Yasui, Meteorology
T. Yoshikawa, Glaciology

The wintering party consists of:

E. Nishibori, Leader
T. Frijii, Pilot
T. Kikuchi, Geologist
T. Kitamura, Handy man
S. Nakano, Medical officer
T. Saeki, Handy man
T. Sakuma, Radio engineer
M. Sunada, Cook
T. Tatsuni, Geologist

*New Zealand*

Members of the New Zealand International Geophysical Year and Trans-Antarctic Expedition parties left New Zealand on 21 December 1956 in H.M.N.Z. *Endeavour*, Captain H. Kirkwood. Some members of both parties and stores were transported by the United States ships *Curtiss*, *Glacier* and *Private John R. Towle*. *Endeavour* entered the pack ice on 27 December and a very severe storm was met at the New Year. On 4 January 1957 *Endeavour* and *Glacier* reached a point in McMurdo Sound nine miles east of Butter Point, where it had been intended to establish the New Zealand station. Attempts to find a suitable site were unsuccessful, and finally a new site was chosen at Pram Point, on the south coast of Ross Island, two miles north-east of Cape Armitage. "Scott" station was built on a terrace about 40 ft. above sea level. *Endeavour* left McMurdo Sound on 22 February. Members of the New Zealand International Geophysical Year party were T. Hatherton, V. B. Gerard, W. J. P. Macdonald, R. H. Orr and H. N. Stanford.

*New Zealand/United States*

"Adare" station was established by the United States ships *Northwind* and *Arneb* between 4 and 31 January 1957. It is situated in Moubray Bay near Cape Hallett, about 70 miles south of Cape Adare. Both ships suffered damage during a violent storm on 31 December 1956, and *Northwind* was forced to return to New Zealand for repairs. The wintering party here consists of one American, J. A. Shear, and three New Zealanders, J. G. Humphries, C. E. Ingham and M. V. Langevad, and ten American naval maintenance men.

*Norway*

The Norwegian expedition left Oslo on 10 November 1956 in *Polarsirkel* and *Polarbjørn*. Members of the party are:

Sigurd Helle, Leader and geodesist
O. Gjeruldsen, Scientific assistant
B. Grytøyr, Meteorological assistant
A. Hemmestad, Mechanic
H. M. Henriksen, Meteorological assistant
L. Hochlin, Radio operator and dog driver
P. Larsen, Steward
T. Lunde, Glaciologist
N. Nergaard, Scientific assistant
H. Sæther, Medical officer
S. Sørensen, Radio operator
J. Snuggerud, Radio mechanic
J. Tonnesen, Meteorologist
T. Vinje, Meteorologist

The expedition took three tractors and forty-four Greenland dogs.

The two ships reached the ice front in about long. 10° W. on 30 December 1956. They then separated and sailed along the ice front in opposite directions until *Polarbjørn* reported a suitable landing site in lat. 70° 5′ S., long. 2° 15′ W. On 5 January 1957 a site for the station was chosen about 30 km. (19 miles) inland in lat. 70° 30′ S., long. 2° 32′ W. Bad weather from 6 to 13 January delayed unloading, but by 18 January the station had been partly built, and on the 20th the ships left on their way north.

New Zealand/United States station "Adare", Cape Hallett, 1957.

*Photograph by United States Navy*

United States "Amundsen-Scott" station at the South Pole, 1957

*Photograph by United States Navy*

Davis, Vestfold Hills, Princess Elizabeth Land (see p. 533)

*A.N.A.R.E. photograph by Philip Law*

(*Facing p.* 537)

On 12 March direct radio contact with Bergen Radio was established.

The expedition has taken a specially designed radio-sonde hut with them; it is made of aluminium sheets supported on an angle-iron framework and has a roof which opens mechanically for the release of balloons.

*United Kingdom*

*Magga Dan*, carrying the main parties of both the Royal Society Antarctic Expedition and the Trans-Antarctic Expedition, with *Tottan*, supplementary supply ship to the Royal Society Antarctic Expedition, both arrived in Halley Bay on 4 January 1957. After unloading, *Magga Dan* sailed on to "Shackleton", and called in at Halley Bay again on 29 January on her homeward voyage. *Tottan* left on 14 January. The erection of huts at Halley Bay was completed by mid February.

The first routine ascent of a meteorological balloon (rawin-sonde) was made on 1 April.

The first Emperor Penguins returned to the bay on 6 April, and, by the 23rd, it it was estimated that over 10,000 had arrived.

A new Falkland Islands Dependencies Survey station was opened in west Graham Land during 1956. This is in Lallemand Fjord in lat. 66° 55′ S., long. 66° 48′ W. It will contribute meteorological data to the International Geophysical Year programme.

*United States*

In September 1956, Dr Laurence M. Gould was appointed Scientific Director of the United States International Geophysical Year Antarctic programme, with Dr Paul A. Siple as Deputy Director. Leaders at the United States stations are Dr Paul A. Siple ("Amundsen-Scott" station at the South Pole), A. P. Crary ("Little America V"), G. R. Toney ("Byrd" station), Finn Ronne ("Ellsworth" station), C. R. Elklund ("Wilkes" station), and J. A. Shear ("Adare" station). Rear-Admiral George A. Dufek was commander of "Task Force 43", which consisted of the icebreakers *Atka*, *Glacier*, *Staten Island* and *Northwind*, the seaplane tender *Curtiss*, the tanker *Nespelen*, the destroyer escort *Brough* and cargo ships *Arneb*, *Greenville Victory*, *Private Joseph E. Merrell*, *Private John R. Towle* and *Wyandot*. *Glacier* and *Brough* took up stations between New Zealand and Antarctica to support aircraft during the 2500-mile flights to McMurdo Sound. The forty aircraft used during the operation included four R 4D ski-rigged "Skytrains", two R5D wheel-rigged "Skymasters", four P2V ski-rigged "Neptunes", nine UC-1 ski-rigged "Otters", eight C-124 "Globemaster" cargo aircraft and eleven helicopters. During the season four aircraft were severely damaged with the loss of four lives. One man was drowned when a "weasel" went through the ice in McMurdo Sound.

"*Little America V*." Stores and equipment for this station and "Byrd" station were unloaded from *Atka*, *Greenville Victory*, *Private Joseph E. Merrell* and *Nespelen*. The large group of scientists who will operate Weather Central arrived on *Curtiss* on 30 January 1957; they included an Argentine, J. Alvarez, a New Zealander, E. G. Edie, and a Russian, L. Rastorguyev.

"*Byrd*" *station*. A mechanized reconnaissance party, commanded by Major M. R. Dawson, left "Little America V" on 7 November 1956. After an extremely difficult journey up to the Rockefeller Plateau, the site of the station, in lat. 120° S., long. 80° W., was reached on 16 December. Meanwhile a tractor train, carrying 150 tons of material, left "Little America V" on 5 December, and arrived at "Byrd" station on the 23rd. Construction began immediately and the station was commissioned on 1 January 1957. A second tractor train, and air-drops of supplies and men, completed

the establishment of the station by the end of January. The wintering party consists of thirteen scientists and a naval support party of ten.

"*Amundsen-Scott*" *station.* The first aircraft landing at the South Pole was made on 31 October by an R4D "Skymaster". Rear-Admiral Dufek took part in the flight. On 20 November eight members of a construction team, with dogs and sledges, were landed about 8 miles from the South Pole. A "weasel" was dropped by parachute, but broke down soon afterwards. Another man joined the party by parachute a few days later to direct air drops, and ten others were landed the following week. Supplies and building materials were then flown in as quickly as weather conditions allowed, and were either landed or air dropped. The soft condition of the air strip at McMurdo Sound, due to high temperatures, made the use of wheeled aircraft difficult during January 1957, but eighteen landings had been made at the South Pole by the end of the month.

About 450 tons of supplies and materials had been delivered by air up to the middle of December 1956. The construction party had erected two large Jamesway huts and five other buildings before the end of the year.

Dr Siple, and three other members of the International Geophysical Year party, arrived on 1 December. Regular three-hourly surface weather observations had begun by 25 January 1957, and the installation of other scientific equipment nearly completed.

The wintering party consists of nine scientists and eight naval maintenance men.

"*Wilkes*" *station. Glacier* escorted *Arneb* and *Greenville Victory* to Vincennes Bay after the establishment of "Adare" station, and unloading began at Clark Peninsula on 1 February. This promontory was previously thought to be an island. Unloading was completed and the camp fully established by 17 February, when the ships left to return to McMurdo Sound. The wintering party consists of ten scientists and seventeen naval maintenance men.

"*Ellsworth*" *station.* The Weddell Sea Task Group, consisting of *Staten Island* and *Wyandot*, visited the stations at Halley Bay, "Shackleton" and "General Belgrano" in the Weddell Sea before becoming trapped in heavy pack ice, in lat. 77° 37′ S., long. 43° 19′ W., on 1 January 1957. Eleven days later they broke loose and sailed on westwards, though both ships had suffered damage to their propellors. The most westerly point reached was near Bowman Peninsula, in lat. 74° 47′ S., long. 62° 22′ W., on 18 January. Ice conditions then forced the ships to return eastwards. A site for the station was chosen, in lat. 77° 43′ S., long. 41° 07′ W., on 25 January; it is about 2 miles inland and 35 miles west of "General Belgrano" station. The ships sailed on 12 February, leaving a wintering party of ten scientists and eight naval maintenance men. *Northwind*, now repaired in New Zealand after being damaged at "Adare" station, sailed down to assist the damaged *Staten Island* and *Wyandot* out of the Weddell Sea ice.

"*Beardmore Strip.*" A small support and re-fuelling station was established on 28 October 1956 in lat. 85° S., long 165° W., at the outlet of the Liv Glacier. Three men were stationed there throughout the flying season, and withdrawn on 21 February 1957 when this ended.

*Naval Air Facility, McMurdo Sound.* During the season, *Curtiss*, *Nespelon* and *Towle* unloaded supplies and aviation fuel, including supplies for the "Amundsen-Scott" station, here.

## *U.S.S.R.*

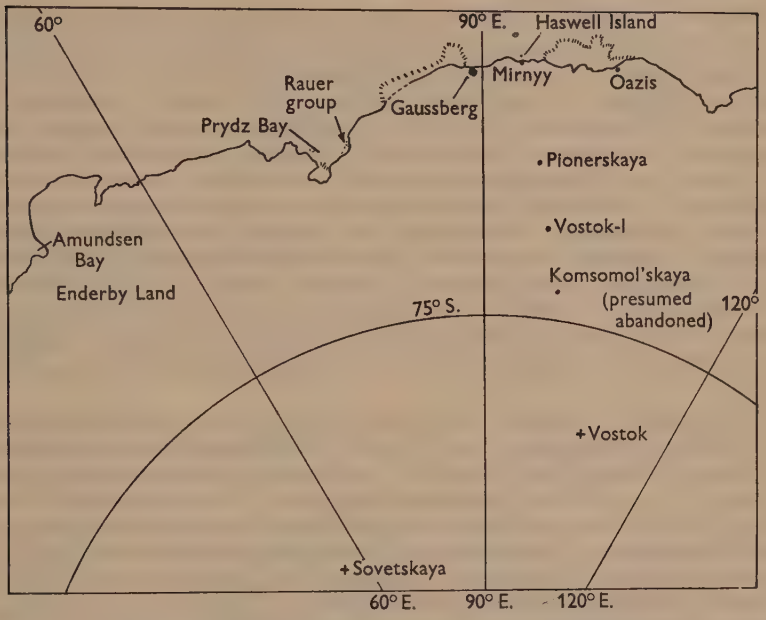
The relief party and stores were taken in three ships: *Ob*' left Kaliningrad on 7 November 1956 and arrived at "Mirnyy" on 11 December, *Kooperatsiya* left on 25 November and arrived on 10 January 1957, *Lena* left on 11 December and

arrived on 22 January. *Lena* was prevented by ice from going to the usual unloading point at "Mirnyy", so went 200 km. westwards along the coast and there unloaded the aircraft, which were urgently required to help set up the inland stations. She returned to "Mirnyy" on 26 January and unloaded at a 15 m. high ice cliff. On 3 February a piece broke off this cliff during unloading and two men were killed.

The *Ob'* and the *Lena* were both used by the expedition during the season 1955–56. The *Kooperatsiya* is a smaller freighter, not of special design but probably strengthened for use on the Northern Sea Route.

The three ships brought 188 winterers (replacing last year's 92), including Mr Gordon Cartwright of the United States Weather Bureau. There were in addition a number of visitors for the summer season. There are some leading scientists in the party, of which the main figures are:

A. F. Treshnikov, Leader of continental group
B. L. Dzerdzeyevskiy, Meteorologist
P. A. Gordiyenko, Glaciologist specializing in sea ice
S. P. Khromov, Meteorologist
K. K. Markov, Geographer
P. P. Moskalenko, Leader of flying detachment
G. D. Rikhter, Glaciologist specializing in snow
P. A. Shumskiy, Glaciologist specializing in land ice; in charge of glaciological section of 38 men
M. Ravich, Geologist




Soviet activities during 1956–57 season, with established and proposed stations.

Established ● Proposed +

*Oceanographical group*

As in 1955–56, an extensive oceanographical investigation of the Southern Ocean was planned. I. V. Maksimov is in charge. The *Ob'* left "Mirnyy" on 15 January and started working westwards along the coast. She called at the Rauer group in Prydz

Bay on 27 January, and sent a party ashore. She arrived near the newly established Japanese station on Ongul Island in Lützow-Holmbukta on 28 February, in response to a call for help, and assisted the Japanese expedition ship *Soya* to get free of the ice. The programme of oceanographical work is wide, and includes all the lines of study to be expected in a well-equipped expedition with seventy scientific workers—composition and dynamics of water masses, bottom relief, submarine geology, gravimetry, biology, earth magnetism, and meteorology. The first work area was the Southern Ocean between long. 90° E. (the longitude of "Mirnyy") and 20° E. After working here, the *Ob'* was in Cape Town from 13 to 17 March, whence she sailed on to Îles de Kerguelen, and then back to "Mirnyy". The *Lena* also did a programme of oceanographical work, but a more limited one. She left "Mirnyy" on 14 February, heading westwards. By the second half of March she had reached Enderby Land, at the western boundary of the Australian sector, where several days were spent in Amundsen Bay, and she returned to "Mirnyy" in early April. About 3000 km. of coastline were photographed from the ship's aircraft, and a special study of sea ice carried out.

*Establishment of stations*

At the beginning of the season there were three Soviet stations: "Mirnyy", the main base and I.G.Y. station; "Pionerskaya", an intermediate support station 375 km. to the south at an altitude of 2750 m.; and "Oazis", a scientific station in the ice-free area 360 km. to the east.

The Soviet contribution to the I.G.Y. calls for establishment of two inland stations: "Vostok" at the South Geomagnetic Pole, 1500 km. from "Mirnyy", and "Sovetskaya" at the Pole of Relative Inaccessibility, 2200 km. from "Mirnyy". Two intermediate stations were planned: "Pionerskaya" on the way to "Vostok", "Komsomol'skaya" on the way to "Sovetskaya". This season's first objective was to establish "Vostok".

The men at "Pionerskaya" were relieved by air on 17 November. The new leader was N. Rusin. On 29 December, after the *Ob'* had arrived, a tractor train set out for "Pionerskaya". Treshnikov, the new leader of the continental group, and seven men, went with it. They reached "Pionerskaya" on 7 January, left fuel there, and returned to "Mirnyy". The station was relieved again by air in early February, the new leader being G. Pashchenko. During January and early February 30 sorties were flown to "Pionerskaya" from "Mirnyy", bringing stores for the tractor trains which were expected to pass through. Pashchenko was shortly afterwards transferred to "Oazis", where he remained to lead the wintering party, which had been increased to seven.

It was decided to establish "Komsomol'skaya" as an additional intermediate station between "Pionerskaya" and "Vostok" (evidently the earlier plan of setting up "Komsomol'skaya" on the route to "Sovetskaya" was abandoned, at least for this season). V. S. Pelevin, the leader-designate of "Komsomol'skaya", and ten men left "Mirnyy" on 14 February in three tractors towing two sledges each. They reached "Pionerskaya" on 21 February. Aircraft helped them to navigate, and flew in further supplies to "Pionerskaya" for them. They left again on 27 February, and on 7 March reached a point 864 km. from "Mirnyy", where "Komsomol'skaya" was established. More supplies were flown in, and Treshnikov visited the site. Later accounts, however, do not mention this station, so it seems likely that for some reason it had to be abandoned. The party which was to establish "Vostok", led by V. G. Aver'yanov and travelling in five tractors with two sledges each, left "Mirnyy" on 28 February, passed through "Pionerskaya", and stopped for the winter on 18 March 635 km. from "Mirnyy" at an altitude of about 3500 m. Difficult conditions prevented further advance, and the camp site was named "Vostok-I". This party intends to push on the remaining 800 to 900 km. in the southern spring of 1957.

## INTERNATIONAL GEOPHYSICAL YEAR STATIONS IN ANTARCTICA AND THE SUB-ANTARCTIC ISLANDS

*(Key to map opposite)*

### *ARGENTINA*

1 "Teniente Esquivel", Thule Island, 59° 27′ S., 27° 16′ W.
2 "Orcadas", Laurie Island, 60° 45′ S., 44° 43′ W.
3 "Teniente Camara", Half Moon Island, 62° 36′ S., 59° 57′ W.
4 "Decepción" or "Primero de Mayo", Deception Island, 62° 59′ S., 60° 42′ W.
5 "Esperanza", Hope Bay, 63° 24′ S., 56° 59′ W.
6 "Melchior", Gamma Island, 64° 20′ S., 62° 59′ W.
7 "Almirante Brown", Paradise Harbour, 64° 53′ S., 62° 52′ W.
8 "General San Martin", Barry Island, 68° 08′ S., 67° 07′ W.
9 "General Belgrano", Filchner Ice Shelf, 77° 59′ S., 38° 44′ W.

### *AUSTRALIA*

10 Macquarie Island, 54° 30′ S., 158° 57′ E.
11 Mawson, Mac-Robertson Land, 67° 36′ S., 62° 53′ W.
12 Davis, Princess Elizabeth Land, 68° 35′ S., 77° 59′ E.

### *BELGIUM*

13 Breidvika, Prinsesse Ragnhild Kyst, 70° 15′ S., 23° E., approx.

### *CHILE*

14 Coppermine Cove, Robert Island, 62° 22′ S., 59° 45′ W.
15 "Arturo Prat", Greenwich Island, 62° 29′ S., 59° 38′ W.
16 Yankee Harbour, Greenwich Island, 62° 32′ S., 59° 47′ W.
17 "Pedro Aguirre Cerda", Deception Island, 62° 56′ S., 60° 36′ W.
18 "General Bernardo O'Higgins", Cape Legoupil, 63° 19′ S., 57° 54′ W.
19 "Luis Risopatron", near Cape Legoupil, 63° 19′ S., 57° 54′ W., approx.
20 "Presidente Gabriel Gonzalez Videla", Paradise Harbour, 64° 49′ S., 62° 52′ W.

### *FRANCE*

21 Port-aux-Français, Îles de Kerguelen, 49° 20′ S., 70° 14′ E.
22 "Dumont d'Urville", Terre Adélie, 66° 40′ S., 140° 01′ E.
23 "Charcot", Terre Adélie, 69° 30′ S., 140° E., approx.

### *JAPAN*

24 "Showa", Ongul Island, 69° 29′ S., 39° 35′ E.

### *NEW ZEALAND*

25 Campbell Island, 52° 33′ S., 169° 09′ E.
26 "Scott", Pram Point, 77° 50′ S., 166° 44′ E.

### *NORWAY*

27 Kronprinsesse Märtha Kyst, 70° 30′ S., 2° 15′ E.

### *SOUTH AFRICA*

28 Marion Island, Prince Edward Islands, 46° 53′ S., 37° 52′ W.
29 Gough Island, 40° 19′ S., 9° 54′ W.
30 Tristan da Cunha, 37° 03′ S., 12° 18′ W.

### *UNITED KINGDOM*

31 Stanley, 51° 42′ S., 57° 52′ W.
32 Grytviken, South Georgia, 54° 17′ S., 36° 30′ W.
33 Signy Island (Base H), South Orkney Islands, 60° 43′ S., 45° 36′ W.
34 Admiralty Bay (Base G), King George Island, 62° 05′ S., 58° 25′ W.
35 Deception Island (Base B), South Shetland Islands, 62° 59′ S., 60° 34′ W.
36 Hope Bay (Base D), Trinity Peninsula, 63° 24′ S., 56° 59′ W.
37 View Point, Duse Bay, 63° 32′ S., 57° 24′ W.
38 Port Lockroy (Base A), Palmer Archipelago, 64° 50′ S., 63° 31′ W.
39 Argentine Islands (Base F), off Graham Coast, 65° 15′ S., 64° 16′ W.
40 Loubet Coast (Base W), 66° 55′ S., 66° 48′ W.
41 Horseshoe Island (Base Y), Marguerite Bay, 67° 49′ S., 67° 17′ W.
42 Halley Bay (Royal Society base), Caird Coast, 75° 31′ S., 26° 36′ W.
43 "Shackleton" (Trans-Antarctic Expedition base), Filchner Ice Shelf, 77° 57′ S., 37° 16′ W.
44 "South Ice" (Trans-Antarctic Expedition advance base), 81° 56′ S., 29° 30′ W.

### *UNITED STATES*

45 "Little America V", Kainan Bay, 78° 16′ S., 162° 28′ W.
46 "Byrd station", Marie Byrd Land, 80° S., 120° W., approx.
47 South Geographical Pole
48 "Ellsworth station", Filchner Ice Shelf, 77° 43′ S., 41° 07′ W.
49 "Wilkes station", Vincennes Bay, 66° 35′ S., 109° E., approx.
50 "Williams Air Operations Facility", Ross Island, 77° 51′ S., 166° 37′ E. (Operational support base)

### *UNITED STATES/NEW ZEALAND*

51 "Adare station", Cape Hallett, 72° S., 171° E., approx.

### *U.S.S.R.*

52 "Mirnyy", Queen Mary Land, 66° 37′ S., 93° E.
53 "Vostok", South Geomagnetic Pole area, Wilkes Land, 78° S., 107° E. approx.
54 "Sovetskaya", area of so-called "Pole of Relative Inaccessibility", Enderby Land, 82° S., 55° E., approx.
55 "Pionerskaya", Queen Mary Land, 69° 44′ S., 95° 30′ E. (Operational support base)
56 "Komsomolskaya", Princess Elizabeth Land, 74° S., 99° E., approx. (Operational support base)
57 "Oazis", Queen Mary Land, 66° 30′ S., 101° E., approx.
58 "Vostok-I", Queen Mary Land, 72° S., 97° E., approx.

(*Facing p.* 541)

There has been no mention of detailed plans for establishing "Sovetskaya" at the Pole of Relative Inaccessibility. The leader-designate of that station, S. Kartashev, went with the glaciological tractor train (see below).

*Glaciological journey*

The plan is for a tractor train to travel, in the course of two seasons, round the triangle "Mirnyy"–"Vostok"–"Sovetskaya"–"Mirnyy", a distance of 5000 km., carrying out various glaciological measurements, including seismic sounding, *en route*. The train set out from "Mirnyy" on 7 February, under Shumskiy, with fifteen men. It was to work along the line "Mirnyy"–"Vostok", but getting no farther than "Komsomol'-skaya" this season. It returned to "Mirnyy" in late April.

*Other activities*

An air survey team led by B. Dubovskiy, which came for the summer only, completed the field work, including astronomical points, necessary for constructing a map of the coastal area in the vicinity of "Mirnyy". The geological party under M. Ravich investigated nunataks over an area extending 800 km. in each direction along the coast from "Mirnyy" (between longs. 80° and 110° E.) and 100 to 150 km. inland. Particular attention was paid to the ice-free area around "Oazis". An airborne magnetometer survey was made. A glaciological group under B. P. Barkhatov was flown to the Gaussberg region to obtain measurements of glacier flow comparable with Drygalski's in 1902, and another worked at "Oazis". Biologists studied penguins on Haswell Island. The seismic station at "Mirnyy" functioned throughout the year, and has not yet recorded an earthquake epicentre in the Antarctic continent. Magnetic observations were continuously recorded. Meteorological work included a special study of winds.

*Return of first party*

*Kooperatsiya*, carrying M. M. Somov, the leader, and other members of the 1956 wintering party, left "Mirnyy" on 15 February and reached Riga on 5 April. *Ob'* and *Lena* picked up the remainder of those due to return in early April.

# NOTES

## FILMS ON POLAR EXPLORATION AND RESEARCH

[This preliminary catalogue is a revised version of a list compiled by Frank Bamping in the *Scientific Film Review*, Vol. 3, No. 2, 1957, p. 53–68. The author is Information Officer of the Scientific Film Association, 164 Shaftesbury Avenue, London, W.C. 2. He would be grateful for corrections and additions to this list. Abbreviations: b. and w. = black and white; col. = coloured; sd. = sound; si. = silent.]

*Across Arctic Ungava.* 16 mm. sd. col. 20 min. Canada, 1949.
Producer: National Film Board of Canada with the National Museum of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 391.) (Hire.)
An expedition to Ungava Peninsula. The film is one in the "Arctic Notebook" series.

*Across the Antarctic.* 16/35 mm. sd. b. and w. 13 min. Great Britain, 1956.
Producer: World Wide for Foreign Office.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (V. 426.) (Hire.)
A recorded interview for television between Robert McKenzie and Dr V. Fuchs and Sir Edmund Hillary in which they discuss their plans for the trans-Antarctic crossing of 1957–58.

*Adventures on an ice floe.* 16 mm. sd. b. and w. 50 min. U.S.S.R., 1954–55.
Producer: Moscow Central Documentary Film Studios.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Mainly devoted to the day-to-day activities of the two drifting scientific bases, SP-3 and SP-4, This film is also known by the following titles: *376 Days on the drifting ice floe*, and *In the heart of the Arctic.*

*The Alaskan Eskimo.* 35 mm. sd. col. 27 min. United States, 1952.
Producer: Walt Disney.
Distributor: RKO Pictures Ltd., 2–4 Dean Street, London, W. 1. (Hire.)
The Alaskan Eskimo.

*Antarctic lands.* 16 mm. si. b. and w. 7 min. Great Britain, 1949.
Producer: Crown Film Unit.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (CE. 401.) (Hire.)
Life with the Falkland Islands Dependencies Survey.

*Antarctic outpost.* 35 mm. sd. b. and w. 10 min. New Zealand.
Distributor: Famous Films (London) Ltd., 179 Wardour Street, London W. 1. (Hire.)
A relief ship reaches the Campbell Island weather station.

*Antarctique.* (*2ème hivernage 1951.*) 16 mm. col. sd. 85 min. France, 1951.
Producer: R. Kirschner.
Distributor: Productions Jean Image, 27 rue des Petits Champs, Paris.
There is a commercial version, 35 mm. col. sd.

*Antarctic venture.* 16 mm. sd. col. 30 min. South Africa, 1949–52.
Distributor: J. A. King, of the Weather Bureau, c/o Films Division, Department of Education, Arts and Sciences, Impala House, Schoeman Street, Pretoria.
The voyage of the *Norsel* in 1949 to Dronning Maud Land for the establishment of the Norwegian–British–Swedish Antarctic Expedition, 1949–52.

*Antarctic vigil.* 16 mm. sd. col. 10 min. Australia.
Distributor: Australian News and Information Bureau, Australia House, London, W.C. 2. (Hire.)
The activities of Australian scientists on Heard Island and Macquarie Island.

*Antarctic whalehunt.* 16/35 mm. sd. b. and w. 20 min. Great Britain, 1947.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (C. 4608.) (Hire.)
This film is No. 12 in the "This Modern Age" series. It deals with the mounting of modern whaling expeditions and their threat to the extinction of the whales.

*Aptenodytes forsteri.* (*3ème hivernage 1952.*) 35 mm. b. and w. sd. 15 min. France, 1951.
Producer: M. Marret.
Distributor: Armor Films, 128 rue La Boetie, Paris, France.
There is a 16 mm. sd. copy of this film. A study of the life and habits of Emperor Penguins, made in Terre Adélie.

*Arctic.* 16 mm. si. b. and w. 5 min. Great Britain, 1932.
Producer: Empire Marketing Board.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 472.) (Hire.)
The life of the Eskimo during winter.

*Arctic airlift.* 16 mm. sd. col. 10 min. Great Britain, 1952.
Producer and Distributor: Air Ministry, Information Division, 2 Richmond Terrace, S.W. 1.
Some aspects of the work of the R.A.F. during the British North Greenland Expedition, 1952–54.

*Arctic dog team.* 16 mm. sd. col. 11 min. Canada, 1949.
Producer: National Film Board of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 275.) (Hire.)
One of the "Arctic Notebook" series, this film is a study of the part played by husky dogs in the life of the Eskimo in the Canadian Eastern Arctic.

*Arctic Essay* No. 1. See *North of 60.*

*Arctic Essay* No. 2. See *Invasion from the South.*

*Arctic Essay* No. 3. See *Our Northern Citizen.*

*Arctic harvest.* 16/35 mm. sd. b. and w. 11 min. Great Britain, 1955.
Producer: GBI for Seven Seas Codliver Oil.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (C. 1613.) (Hire.)
The cod fishing fleet at work in Arctic waters around Bjørnøya. Also covers the extraction, transport and processing of the oil.

*Arctic highway.* 16 mm. sd. b. and w. 20 min. Great Britain.
Distributor: Wallace Heaton Ltd., 127 New Bond Street, London, W. 1. (SF. 3098.) (Hire.)
A car journey from Helsinki along the arctic highway for a thousand miles north to the Arctic Ocean.

*Angotee—story of an Eskimo boy.* 16 mm. sd. col. 32 min. Canada, 1952.
Producer: National Film Board of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 433.) (Hire.)
The life of an Eskimo boy from birth to manhood.

*Arctic hunters.* 16 mm. sd. b. and w. 17 min. Canada, 1944.
Producer: National Film Board of Canada.
Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)

*Arctic jungle.* 16/35 mm. sd. col. b. and w. 11 min. Canada, 1948.
Producer: National Film Board of Canada.
Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
The problems of the Eskimo's struggle for survival.

*Arctic laboratory.* 16 mm. sd. b. and w. 37 min. Great Britain.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (F. 4586.) (Hire.)
The Oxford University Expedition to Jan Mayen, 1947, and their research on marine and plant life, geology, insects and birds of the island.

*Arctic Notebook* No. 1. See *How to build an igloo.*

*Arctic Notebook* No. 2. See *Arctic dog team.*

*Arctic Notebook* No. 3. See *Across Arctic Ungava.*

*Arctic pioneers in Baffin Land.* 16 mm. si. b. and w. 20 min.
Distributor: Religious Films Ltd., 6 Eaton Gate, London, S.W. 1.
The Eskimo and missionary work among them.

*Arctic thrills.* 16 mm. sd./si. b. and w. 10 min. United States, 1941.
Distributor: Wallace Heaton Ltd., 127 New Bond Street, London, W. 1. (Hire.)
A trip by boat to the Arctic. Seal, Walrus and Polar Bear hunt.

*Australian Diary* No. 15—Antarctic adventure. 16 mm. sd. b. and w. 10 min. Australia, 1948.
Distributor: Australian News and Information Bureau, Australia House, London, W.C. 2. (Hire.)
Australian scientific expedition to Heard Island to establish a weather tation and investigate the natural history of the island.

*Australian Diary* No. 16. 16 mm. sd. b. and w. 10 min. Australia, 1948.
Distributor: Australian News and Information Bureau, Australia House, London, W.C. 2. (Hire.)
Part A—an Australian ship, carrying an expedition mounted by A.N.A.R.E., alls at the abandoned whaling station on Îles de Kerguelen on the way to Heard Island.

*Australian Diary* No. 27. 16 mm. sd. b. and w. 10 min. Australia, 1949.
Distributor: Australian News and Information Bureau, Australia House, London, W.C. 2. (Hire.)
Part C—The arrival of an expedition at Heard Island, 1947.

*Based on Deception.* 35 mm. sd. col. 32 min. Great Britain, 1956.
Producer: Seven Seas Films for Hunting Aerosurveys, Ltd.
Distributor: 20th Century Fox Film Co. Ltd., 31 Soho Square, London, W. 1. (Hire.)
Establishment of a base on Deception Island and survey over Graham Land nd off-lying island groups, using flying boats and helicopters. The stages in roduction of a map based on air photography are shown.

*The blue ice.* 16 mm. sd. col. 30 min. Australia, 1955.
Distributor: Australian News and Information Bureau, Australia House, London, W.C. 2. (Hire.)
An account of the 1953–54 Australian National Antarctic Research Expedi- ion and the base at Mawson.

*Bouvet Island.* 16 mm. sd. col. 15 min. South Africa, 1955.
Distributor: J. A. King, of the Weather Bureau, c/o Films Division, Department of Education, Arts and Sciences, Impala House, Schoeman Street, Pretoria, South Africa.
The visit of S.A.S. *Transvaal* to Bouvetøya on a reconnaissance expedition n 1955.

*The British North Greenland Expedition.* 16 mm. sd. col. 20 min. Great Britain, 1954.
Producer: H. E. Lewis and P. F. Taylor.
Distributor: H. E. Lewis, Medical Research Council, Holly Hill, Hampstead, London, N.W. 3. (Restricted.)
Scientific activities of the first year of the British North Greenland Expedition, 1952–54 (now superseded by *Challenge of the north* and *Polar hysiology*).

*Campbell Island.* 16 mm. sd. b. and w. 9½ min. New Zealand, 1952.
Distributor: New Zealand Film Library, Adelphi, John Adam Street, London, W.C. 2. (Hire.)
Activities of the weather station on Campbell Island and some of the wild life.

*Challenge of the north.* 35 mm. sd. col. 32 min. Great Britain, 1955.
Producer: British North Greenland Expedition: P. F. Taylor for Beaconsfield Films Ltd.
Distributor: None fixed: inquiries to National Film Finance Corporation, 27 Soho Square, London, W. 1.
The story of the British North Greenland Expedition, 1952–54.

*Chiens polaires.* (*3ème hivernage 1952.*) 16 mm. si. col. 25 min. France, 1952
Producer: M. Marret.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Chronique filmée de l'expedition 1948.* 16 mm. si. b. and w. 25 min. France, 1948
Producer: Samivel.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Commandant Charcot.* 16 mm. sd. b. and w. 20 min. France, 1949.
Distributor: French Institute, Queensberry Place, London, S.W. 7 (Hire.)
The French Antarctic Expedition, 1948–49, in the ship of this name.

*Conquerors of the north.* 35 mm. sd. b. and w. 68 min. U.S.S.R., 1938.
Distributor: Inquiries to Sovexportfilm, 5 Kensington Palace Gardens, London, W. 8.
A film record of the Soviet expedition to the North Pole in 1937–38. See also *Four men at the North Pole.*

*Conquest of the Pole.* 16/35 mm. si. b. and w. 19 min. France, 1912.
Distributor: British Film Institute, 164 Shaftesbury Avenue, London W.C. 2. (Hire.)
One of the best known of the famous films by Georges Méliès; a prophetic fantasy of polar exploration by air.

*Continental glaciers.* 16 mm. sd. col. 13 min. United States, 1957.
Producer: Department of Geology, Ohio State University.
Distributor: Department of Photography, Ohio State University, Columbus, Ohio. (Hire and sale.)
The structure of a glacier is graphically portrayed in an animated cross section. The method of measuring its movement is shown, and how the movement of the glacier affects the surface ice, forming crevasses. Basic concepts such as "firn", "kames", "till", "moraine" and "esker" are illustrated.

*Echo whalefinder.* 16 mm. sd. b. and w. 20 min. Great Britain, 1954.
Producer and Distributor: Kelvin Hughes Ltd., Publicity Department, Livingstone College, Knott's Green, Leyton, E. 10. (Free.)
The striking contrast between old and new methods of whale hunting, using modern echo-sounding techniques.

*II hommes dans l'Antarctique.* (*1er hivernage 1950.*) 16 mm. si. b. and w. 30 min. France, 1950.
Producer: J. Sapin-Jaloustre.
Distribution: Expédition Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Eroi della banchisa.* 35 mm. sd. b. and w. Part II in col. 100 min. Italy, 1953.
Producer: Maner Lualdi and Luciano Emmer.
Distributor: R.K.O., Via Romangna 25, Rome, Italy.
Part I. The history of arctic expeditions. Part II. The expedition of the *Italia*, 1928.

*Exercise "Musk Ox".* 16 mm. sd. b. and w. 60 min. Canada, 1946.
Producer: National Film Board of Canada for the Department of National Defence.
Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
A journey across the Canadian Arctic in 1946 in which units of the Canadian Army study the mobility of vehicles and how to tackle the problems of extreme cold.

*Falklands: the story.* 16 mm. sd. col. 11 min. Great Britain, 1951.
Producer: Editorial Productions.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (CE. 227.) (Hire.)
The story of the Falkland Islands Dependencies since 1908 and the life of the men stationed there.

*The Falkland Islands.* 16 mm. sd. col. 11 min. Great Britain, 1951.
Producer: Film Workshop Ltd.; photographed by R. Moss and W. J. L. Sladen.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (CE. 245.) (Hire.)
Life in the Falkland Islands.

*54–40 South.* 16 mm. sd. b. and w. 10 min. New Zealand, 1950.
Distributor: Associated British Film Distributors Ltd., Queen's Walk, London, W. 5. (Hire.)
The R.N.Z. Navy frigate *Tutira* takes stores and personnel to the weather stations on Campbell Island and Macquarie Island.

*Foothold on Antarctica.* 16/35 mm. sd. col. 21 min. Great Britain, 1956.
Producer: World Wide Ltd.
Distributor: British Petroleum Ltd., Britannic House, Finsbury Circus, London, E.C. 2. (Free.)
The first voyage of the Commonwealth Trans-antarctic Expedition to "Shackleton" in the Weddell Sea, 1955–56.

*The formation of icebergs on the coast of Greenland.* 16 mm. si. b. and w. 10½ min. Germany, 1934.
Producer: W. Riml and E. Sorge.
Distributor: Institut für den Wissenschaftlichen Film, Bunsenstrasse 10, Göttingen, West Germany. (C. 357.) (Hire.)

*Four men at the North Pole.* 35 mm. sd. b. and w. 68 min. U.S.S.R., 1938.
Distributor: Inquiries to Sovexportfilm, 5 Kensington Palace Gardens, London, W. 8.
Papanin's expedition to the North Pole, 1937–38. Supplementary to *Conquerors of the north.*

*Gateway to the Antarctic.* 35 mm. sd. col. 41 min. Great Britain, 1956.
Producer: Countryman Films.
Distributor: Republic Pictures, 38 Soho Square, London, W. 1. (Hire.)
Based on films taken by V. D. Carse in South Georgia during the southern summer, 1955–56.

*The German Greenland Expedition of Alfred Wegener, 1930–31.* 16 mm. si. b. and w. 30 min. Germany, 1930–40.
Producer: E. Sorge.
Distributor: Institut für den Wissenschaftlichen Film, Bunsenstrasse 10, Göttingen, West Germany. (C. 357.) (Hire.)

*Groenland 1949.* (*Campagne 1949.*) 16 mm. si. col. 55 min. France, 1949.
Producer: M. Ichac, J. J. Languepin, J. Masson, R. Krischner, P.-E. Victor.
Distributor: Expédition Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Groenland 1948–1951.* (*Campagnes 1948 à 1951.*) 16 mm. si. col. 80 min. France, 1948–51.
Producer: M. Ichac, J. J. Languepin, J. Masson, P.-E. Victor, A. Temporal, and R. Kirschner.
Distributor: Expédition Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Groenland, vingt mille lieues sur les glaces.* (*Campagnes 1949–1950.*) 35 mm. sd. b. and w. 70 min. France, 1949–50.
Producer: M. Ichac, J. J. Languepin.
Distributor: R.K.O., 52 Avenue des Champs Elysées, Paris.

*Heroes of the Arctic.* 16 mm. si. b. and w. 45 min. U.S.S.R., 1933.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
The record of Professor Schmidt's *Chelyushkin* Expedition of 1933.

*Hell below zero.* 16/35 mm. sd. col. 90 min. Great Britain, 1953.
Producer: Warwick Pictures.
Distributor: Columbia Pictures Ltd., Film House, Wardour Street, London, W. 1. (Hire.)
A film version of Hammond Innes' novel *The white south*, the scenes for which were shot from *Kista Dan* in the Weddell Sea.

*How to build an igloo.* 16 mm. sd. col. 11 min. Canada, 1949.
Producer: National Film Board of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 277.) (Hire.)
One of the "Arctic Notebook" series.

*Hunters of the North Pole.* 16/35 mm. sd. b. and w. 10 min. Canada, 1950.
Producer and Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
The activities of the Eskimo hunters near Thule preparing for winter.

*Hunting the natchik.* 35 mm. sd. col. 8 min. United States, 1956.
Producer and Distributor: 20th Century Fox Film Co. Ltd., 31 Soho Square, London, W. 1.
The life of Canada's coastal Eskimo and seal hunting.

*Images des sols du Groenland.* 16 mm. si. b. and w. 15 min. France, 1948.
Producer: A. Cailleux.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Images d'un été (1er hivernage 1950).* 16 mm. si. 20 min. France, 1950.
Producer: J. Sapin-Jaloustre and M. Marret.
Distributor: Armor Films, 128 rue de La Boétie, Paris.
There is a commercial, 35 mm. col. sd. copy of this film.

*In the land of eternal ice.* 35 mm. sd. b. and w. 50 min. U.S.S.R., 1956.
Producer: Central Documentary Film Studios.
Distributor: Inquiries to Plato Films Ltd., 18 Greek Street, London, W. 1.
World preparation for the I.G.Y. and the various expeditions to the Antarctic. The voyage south in the Soviet vessel *Ob'* and the landing of stores at Mirnyy. The arrival of the second supply ship *Lena*. Setting up the Soviet base.

*International Ice Patrol.* 16 mm. sd. b. and w. 22 min. United States, 1949.
Distributor: United States Information Service, Film Section, 5 Grosvenor Square, London, W. 1. (Free.)
How the iceberg menace to North Atlantic shipping lanes is countered by the United States Coastguard's continuous patrol by sea and air.

*Invasion from the south.* 16 mm. sd. b. and w. 30 min. Canada, 1956.
Producer and Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
The film opens with a brief review of efforts to find the North West Passage. H.M.C.S. *Labrador* is now working in these waters collecting information about the coastline, ocean floor, currents, tides and ice conditions.

*It happened in the north.* 16 mm. sd. col. 10 min. U.S.S.R., 1953.
Producer: Moscow Popular Science Film Studio.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
An edited version of *Life in the Arctic*, containing some of the same material with some additional film taken at the same time.

*Journey to the Arctic.* 16 mm. si. col. 8 min. Great Britain, 1957.
Producer and Distributor: Gateway Film Productions Ltd., 470 Green Lanes, London, N. 13. (Hire and Sale.)
The Oxford University Expedition to Nordaustlandet, 1955.

*The life history of the Adélie Penguin.* 16 mm. sd. col. 20 min. Great Britain, 1955–57.
Producer: W. J. L. Sladen.
Distributor: Falkland Islands Dependencies Scientific Bureau, Corner House, 11 Cowley Street, London, S.W. 1.
Based on research in the Antarctic in 1950–51. In 1957 the film was edited and sound track added.

*Life in the Arctic.* 16 mm. sd. col. 70 min. U.S.S.R., 1953.
Producer: Moscow Popular Science Film Studio.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
The wild life which occurs along the Arctic coastline of the Soviet Union.

*King Penguins.* 16 mm. sd. b. and w. 18 min. Great Britain, 1937.
Producer: G.B.I.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (F. 793.) (Hire.)
The habits of the King Penguin both in their natural surroundings and in the Edinburgh Zoo.

*King Penguins.* 16 mm. si. col. Great Britain, 1957.
Producer and Distributor: Bernard Stonehouse, Edward Grey Institute of Field Ornithology, Botanic Gardens, Oxford.
At the time of going to press this film was unfinished, but for the purposes of transmission on ITV a short version lasting about 12 min. was copied on to 35 mm. b. and w. stock. Photographed in South Georgia.

*Land of the long day.* 16 mm. sd. col. 38 min. Canada, 1952.
Producer: National Film Board of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 434.) (Hire.)
Life in Baffin Island during the summer.

*Le Manchot Adélie* (*Pucheramphus adéliae*). 16 mm. b. and w. si. 25 min. France, 1949–51.
Producer: J. Sapin-Jaloustre and J. Cendron.
Distribution: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Le Manchot Empereur*. 16 mm. si. b. and w. 22 min. France, 1952.
Producer: J. Prévost.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Men against the Arctic*. 35 mm. sd. col. 30 min. United States, 1956.
Producer: Walt Disney.
Distributor: Walt Disney Distributors Ltd., 68 Pall Mall, London, S.W. 1. (Hire.)
After historical introduction to Arctic exploration by Eric the Red, Henry Hudson and others, the film picks up the main story of the icebreaker *Westwind* and its voyage to Thule in Greenland. From here an attempt is made to reach the isolated weather station at Alert in Ellesmere Island.

*Modern polar exploration*. 16 mm. sd. col. 10 min. Great Britain, 1951.
Producer: Crown Film Unit.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (V. 358.) (Hire.)
A survey of the conditions of Antarctic exploration compiled from material shot by the Norwegian–British–Swedish Antarctic Expedition, 1949–52, and the Falkland Islands Dependencies Survey.

*Nanook of the north*. 16 mm. si. b. and w. 86 min. United States, 1922.
Producer: Robert Flaherty.
Distributor: British Film Institute, 164 Shaftesbury Avenue, London, W.C. 2. (Hire.)
Important pioneer documentary made in northern Quebec about the Eskimo.

*The navy goes north*. 16 mm. sd. col. 30 min. Canada, 1955.
Producer: The Royal Canadian Navy.
Distributor: Naval Member, Canadian Joint Staff, 66 Ennismore Gardens, London, S.W. 7. (Free.)
The voyage of H.M.C.S. *Labrador* in 1955 to relieve the Arctic outposts and the chain of radar stations.

*Ninety degrees south*. 16/35 mm. sd. b. and w. 73 min. Great Britain, 1934.
Distributor: British Film Institute, 164 Shaftesbury Avenue, London, W.C. 2. (Hire.)
The sound version of H. G. Ponting's film record of Captain Scott's last Antarctic expedition, 1910–13. It was originally shown under the title *With Captain Scott in the Antarctic*, but later it was to be called by various names; *Great White Silence*, *The Epic of Captain Scott* and *The Epic of the South Pole*, etc. In 1933 Ponting added a commentary, relief maps, panoramas, etc.

*Northern lights.* 16 mm. sd. b. and w. 38 min. Great Britain, 1932.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (A. 3050.) (Hire.)
The British Arctic Air Route Expedition, 1930–31, to survey and explore a possible air route from Great Britain by way of Greenland to northern Canada.

*North of 60.* 16 mm. sd. b. and w. 27 min. Canada, 1956.
Producer and Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
The Canadian Arctic and what is being done to exploit its resources.

*Off the coast of Antarctica.* 35 mm. sd. col. 50 min. U.S.S.R., 1956.
Producer: Moscow Popular Science Studios.
Distributor: Inquiries to Plato Films Ltd., 18 Greek Street, London, W. 1.
Historical introduction to Antarctic exploration by British, Norwegian, Australian and American expeditions. In January 1956 the first Soviet base was set up at Mirnyy. The construction of the observatory and the work of the scientists are shown.

*Operation "Ice Cap".* 35 mm. sd. b. and w. 19 min. United States, 1955.
Distributor: R.K.O.—Radio Pictures Ltd., 2–4 Dean Street, London, W. 1. (Hire.)
An account of French exploration of the Greenland ice sheet under Paul-Emile Victor, 1949–50.

*Operations in sea ice.* 16 mm. sd. col. 22 min. United States, 1954.
Distributor: Office of the U.S. Naval Attaché, 7 North Audley Street, London, W. 1. (MN. 7419A.)
An elementary naval training film.

*Operation "Icelift".* See *Arctic Airlift.*

*Operation "Ski Jump II".* 16 mm. sd. b. and w. United States, 1952.
Distributor: Office of the U.S. Naval Attaché, 7 North Audley Street, London, W. 1. (MN. 7478.)
An American expedition to the Arctic by air in 1952.

*Our northern citizen.* 16 mm. sd. b. and w. 30 min. Canada, 1956.
Producer and Distributor: National Film Board of Canada, Colquhoun House, Broadwick Street, London, W. 1. (Hire.)
Deals with problems that increased exploitation of the Arctic have raised for the Eskimo. Part of the film was taken at Aklavik.

*Passage to the Pribilofs.* 16 mm. sd. col. 10 min. United States, 1950.
Distributor: United States Information Service, Film Section, 5 Grosvenor Square, London, W. 1. (Free.)
The story of the restoration and protection of the Fur Seal herds of the Probilof Islands, under the custody of the United States as provided in the Pelagic Sealing Treaty of 1911.

*Pétrels des neiges et Pétrels Antarctiques.* 16 mm. si. b. and w. 11 min. France, 1951.
Producer: R. Kirschner and J. Cendron.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*Polar geography and glaciology.* 16 mm. sd. b. and w. Great Britain, 1957.
Producer: British North Greenland Expedition, 1952–54.
Distributor: Gateway Film Productions Ltd., 470 Green Lanes, London, N. 13.
A rather specialized film for sixth forms and above and also for universities.

*Polar physiology.* 16 mm. sd. col. 12 min. Great Britain, 1956.
Producer: H. E. Lewis and J. P. Masterton, Medical Research Council.
Distributor: MacQueen Film Organisation Ltd., West Street, Bromley, Kent. (Hire and sale.)
Film record of the British North Greenland Expedition, 1952–54, concentrating on the medical aspects.

*Pribilof's Fur Seals and Steller's Sea Lion.* 16/35 mm. sd. col. 8 min. Great Britain, 1949.
Producer: G. C. L. Bertram and H. R. Hewer.
Distributor: British Film Institute, 164 Shaftesbury Avenue, London, W.C. 2. (Hire.)
A record of the physical appearances, feeding habits, mating and care of the young.

*Le regione polari.* 35 mm. sd. b. and w. 12 min. Italy, 1952.
Producer: Renato Spinitti for the Istituto Geographico Polare.
Distributor: Istituto Geographico Polare, Civitanova Marche, Macerata, Italy.
Brief history of Arctic and Antarctic expeditions.

*Scientists in the Antarctic.* 16 mm. sd. col. 15 min. Great Britain, 1952.
Producer: Film Workshop.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (CE. 248.) (Hire.)
The work and life of the men who man seven bases in the Falkland Islands Dependencies.

*Scott of the Antarctic.* 16/35 mm. sd. col. 111 min. Great Britain, 1948.
Producer: Sir Michael Balcon for Ealing Studios.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (Ac. 3062.) (Hire.)
The reconstructed account of Scott's journey to the South Pole in 1911–12.

*Seal Island.* 16/35 mm. sd. col. 27 min. United States, 1949.
Producer: Walt Disney.
Distributor: Walt Disney Film Distributors Ltd., 68 Pall Mall, London, S.W. 1. (Hire.)
The Fur Seals of the Pribilof Islands.

*The secret land.* 16/35 mm. sd. col. 78 min. United States, 1947.
Producer and Distributor: M.G.M., 58 St James's Street, London, S.W. 1. (Hire.)
Full record of the United States Operation "Highjump", in the Antarctic, 1946–47.

*Shackleton's expedition.* 16 mm. si. b. and w. 10 min. Great Britain.
Distributor: Wallace Heaton Ltd., 127 New Bond Street, London, W. 1. (882.) (Hire.)

*Ships, men and ice.* 16 mm. sd. col. 18 min. United States, 1953.
Distributor: United States Information Service, Film Section, 5 Grosvenor Square, London, W. 1. (Free.)
History of Arctic exploration with special reference to the development of ships for that purpose.

*Sondages séismiques sur l'inlandsis du Groenland.* 16 mm. col. si. 25 min. France, 1950.
Producer: J. Masson and J. J. Holtzcherer.
Distributor: Expéditions Polaires Françaises, 47 Avenue du Maréchal Fayolle, Paris 16e.

*67° south.* 16 mm. sd. col. 40 min. Great Britain, 1956.
Producer and Distributor: Falkland Islands Dependencies Survey, Corner House, 11 Cowley Street, London, S.W. 1.
Activities at a station of the Falkland Islands Dependencies Survey; the journey south; building the hut; routine work, including seal hunting and care of huskies; the nature of the terrain and its flora and fauna.

*Soviet whalers.* 16 mm. sd. col. 60 min. U.S.S.R., 1953.
Producer: Moscow Central Documentary Film Studio.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Voyage from Odessa to the Antarctic in a Russian factory ship.

*Terre Adélie.* 16 mm. sd. b. and w. 15 min. France, 1950.
Producer: M. Marret with Armor Films.
Distributor: French Institute, Queensberry Place, London, S.W. 7. (Hire.)
Conditions of life and scientific work of Expéditions Polaires Françaises. Photographed during the winter of 1950.

*Terre des glaces.* 16/35 mm. sd. b. and w. 21 min. France, 1948.
Producer: J. J. Languepin with Armor Films.
Distributor: French Institute, Queensberry Place, London, S.W. 7. (Hire.)
French polar expeditions under Paul-Emile Victor and an account of the Greenland expedition of 1948.

*Visit to Marion Island.* 16 mm. sd. col. 20 min. South Africa.
Distributor: J. A. King, of the Weather Bureau, c/o Films Division, Department of Education, Arts and Sciences, Impala House, Schoeman Street, Pretoria.
Visit to South African meteorological station; the fauna of the island.

*The voyage of Discovery II.* 16/35 mm. sd. b. and w. 20 min. Great Britain, 1936.
Distributor: National Institute of Oceanography, Wormley, near Godalming, Surrey.
Episodes from first four commissions of *Discovery II* in the Antarctic, 1931–36.

*Whaling.* 16 mm. sd. b. and w. 13 min. Great Britain, 1949.
Producer: GBI.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (F. 4577.) (Hire.)
A modern Antarctic whaling fleet at work.

*The white continent.* 16/35 mm. sd. col. 20 min. Great Britain, 1951.
Producer: Crown Film Unit.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3.
The first season of the Norwegian–British–Swedish Antarctic Expedition, 1949–52.

*White safari.* 16 mm. sd. b. and w. 11 min. Canada, 1946.
Producer: National Film Board of Canada.
Distributor: Central Film Library, Bromyard Avenue, London, W. 3. (C. 321.) (Hire.)
A winter journey from Hudson Bay to the Peace River. A shortened version of *Exercise "Musk Ox"* and one of the "Canada Carries On" series.

*The white frontier.* 16/35 mm. sd. b. and w. 16 min. Great Britain, 1952–53.
Producer: Rayant Pictures Ltd.
Distributor: GB Film Library, 1 Aintree Road, Perivale, Greenford, Middlesex. (C. 1636.) (Hire.)
The first year of the British North Greenland Expedition, 1952–54.

*With the sealers in the Arctic.* 16 mm. si. b. and w. 10 min. Great Britain.
Distributor: Dollonds Ltd., 12 George Street, Croydon, Surrey. (E. 350.)

*U.S.S.R. Today No.* 23. 16 mm. sd. b. and w. 12 min. U.S.S.R.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Short account of a Soviet drifting station in the Arctic.

*U.S.S.R. Today No.* 35. 16 mm. sd. b. and w. 12 min. U.S.S.R.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Part 2. Account of the drifting station SP-4.

*U.S.S.R. Today No.* 37. 16 mm. sd. b. and w. 12 min. U.S.S.R.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Work at SP-3.

*U.S.S.R. Today No.* 39. 16 mm. sd. b. and w. 12 min. U.S.S.R.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.
A further account of work at SP-4.

*U.S.S.R. Today No.* 2/56. 16 mm. sd. b. and w. 12 min. U.S.S.R., 1956.
Distributor: Plato Films Ltd., 18 Greek Street, London, W. 1. (Hire.)
Expedition to Mirnyy in Antarctica.

## SNOW RETENTION FOR AGRICULTURAL PURPOSES

[From Rikhter, G. D., *ed. Voprosy ispol'zovaniya snega i bor'ba so snezhnymi zanosami i lavinami* [*Questions of snow utilization and combating snow drifts and avalanches*], Moscow 1956.]

It has long been recognized that snow cover insulates soil from low air temperatures. The greater the depth of snow, and the more powdery it is, the greater the insulation. This affects the temperature of the soil and the depth to which it freezes. The effect is most marked in areas with a continental climate. To quote one example: recent observations near Ubinskoye in south-western Siberia showed that soil beneath 180 cm. of snow froze to a depth of 12 cm., while 25 m. away soil beneath 20 cm. of snow froze to a depth of 90 cm. Thus thick snow cover early in the winter can counter the effect on the soil of low temperatures later on. The effect on winter crops is obvious.

The farmer cannot control the amount of snow falling in his neighbourhood, but he can try to retain it once it has fallen by countering the effect of the wind. The practical measures which Soviet farmers are urged to take must fulfil the following functions:

(1) Build up snow cover of sufficient thickness to protect the crop.
(2) Conserve and collect snow from the beginning of winter.
(3) Ensure that the snow cover is even.
(4) Increase the stability of the snow cover.
(5) Be susceptible of mechanization.

Many measures that have been used are unsatisfactory because they are too time-consuming (building fences or snow walls, distributing straw stooks or brushwood).

Two methods are particularly recommended. One is spring or summer planting of rows of tall plants, such as sunflower, maize, sorghum or mustard, between the rows of the main crop, to form corridors where the snow is retained. This has been found to double yield in many regions. In general, the narrower the corridor, the better the results, but different crops require different treatment. A corridor width of 3·6 m. is recommended for winter wheat, 7·2 m. for winter rye, and 10·8 m. for summer cereals. These figures apply to western Siberia and Kazakhstan. In less windy regions widths may be greater.

The other method is "snow ploughing". Snow is heaped over the rows of crops by means of a special tractor-drawn snow plough which produces a compact wall of snow 40 to 60 cm. high. This method, which is suitable only for

summer crops, has the disadvantage that it can only be done when a reasonable thickness of snow has accumulated, but it has been found more effective than the other in the southern regions, where the dryness of the soil in summer does not always permit the plants forming the corridors to grow high enough.

Apart from its value as an insulator, snow is an important source of moisture. It is advantageous to retain it in fields during the melting period in order that the moisture may soak into the soil. If no measures are taken to keep the snow in place, the melt water may run off before the ground thaws enough to admit it. The corridor method is found effective for this, too, with the rows of retaining plants about 12 to 14 m. apart. Other methods which have had varying degrees of success are not ploughing-in high stubble, ploughing without turning over the top layer of soil, making deep furrows, contour ploughing (on slopes), and ploughing up the snow before thawing starts. Snow compaction, for instance by rolling, has been found to promote rather than hinder thawing, although this had been popularly supposed to be a useful measure.

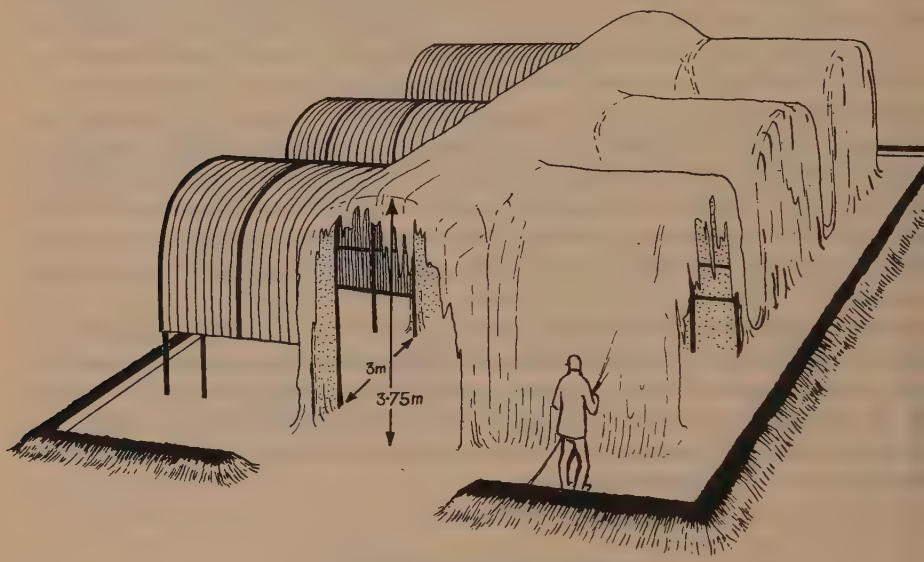
Snow retention was practised in 1948 on 14 million hectares of agricultural land in the U.S.S.R. Research has been undertaken on these problems in the last twenty years or so in various parts of the country, and it continues. G. D. Rikhter, of Institut Geografii Akademii Nauk SSSR (Institute of Geography of the Academy of Sciences of the U.S.S.R.) in Moscow is the leading figure in this activity.

## SOVIET ICE CELLARS

[From Krylov, M. M., *Ledyanoye khranilischche* [*Ice cellar*], Moscow, 1955.]

The figure (p. 558), shows the method of constructing an ice cellar capable of holding 100 metric tons of foodstuffs. The site chosen is excavated in the autumn to a depth of 0·7 to 1·5 m. and the earth is piled round the perimeter, where it forms the lower part of the walls of the finished storehouse. The wooden skeleton framework is then erected, consisting of a series of arches with horizontal members secured to them at intervals varying from 3 to 5 cm. on the top to 30 to 40 cm. on the sides (a small part of this framework is seen through the open doorway on the inside of the first bay on the left). On the framework is stretched matting, wattle, wicker or wrapping paper (this is seen on the outer covering of the left-hand bays). When the frosts begin, the structure is sprayed with water, which forms a cover of ice (seen on the right-hand bays). Lumps of ice and snow can be added to speed the process, until the ice is 2 m. thick on walls, 1·5 to 2 m. thick on the roof, and 0·5 to 0·7 m. deep on the floor. Niches are now cut in the inside of the walls about 1·5 m. high and 0·6 m. deep. In each of these is placed a barrel containing lumps of ice, with a slatted crate on top of it containing ice mixed with 3 to 5 kg. of salt. The effect of this is to lower the temperature of the air below 0° C. More salt is added from time to time. The whole structure is now covered with sawdust, ash, turf, moss or earth to a depth of 0·7 to 1 m. The first layer

of this covering, lying directly on the ice, is wetted so that it freezes on and thus provides better insulation in summer. The foodstuffs are stored in the bays on slatted shelving or in slatted crates. Electric lighting may be installed. A porch and door are added, the former preferably of brick or stone, since the ice tends to melt in this area and wood is likely to rot.




Construction of Soviet ice cellar.

In order to keep the store cool, the door may be left open in the coldest winter months. In summer the temperature can be kept down by sprinkling salt on the floor (2 to 3 kg. per sq.m.) and packing the wall niches with more crushed ice mixed with salt. Storehouses of this sort near Moscow have lasted for 14 years, and are used all the year round.

## UNITED STATES ARCTIC RESEARCH LABORATORY, POINT BARROW, ALASKA

[Summarized from *Arctic Research Laboratory*, Office of Naval Research, Department of the Navy, Washington, D.C.]

The Arctic Research Laboratory of the United States Office of Naval Research was established in 1948 as a centre for specialized study of the Arctic environment. It is situated at Point Barrow, Alaska, where it was at first an adjunct to the facility set up by the United States Navy to prospect for oil in the area. In 1953 this search was discontinued and the Arctic Research Laboratory remained as a separate entity. Since 1955 it has received logistic support from the United States Air Force based on Point Barrow.

The co-ordination and conduct of research activities, and the recruitment of scientists, is carried out by the Arctic Institute of North America through

a special Research Laboratory Advisory Group. The station is operated and maintained by the University of Alaska under contract with the Office of Naval Research. The Science Director and all permanent operational staff are employed by the university.

The main building consists of three quonset-type buildings. It contains seventeen laboratories, a working museum and library, stores, offices and accommodation for thirty-six men. The laboratories are supplied with hot and cold water, electricity, gas, and compressed air. The whole building is heated by hot air furnaces burning natural gas. Darkroom and workshop facilities are also provided. A magnetic observatory has been built three miles from the station. There is accommodation for eight married couples in small quonsets, and also dormitory space. A total of sixty persons can be accommodated in the station.

Field equipment includes a motor launch with a light dredge and fathometer, and four converted landing craft providing facilities for oceanographical work. There are weasels, jeeps and amphibious tractors for overland transport, and bush aircraft are chartered for longer journeys. Meteorological and biological equipment, camping gear and Arctic clothing are available.

## FINNISH–SWEDISH BOUNDARY INSPECTION, 1956

[Summarized from *Dagens Nyheter*, 2 March and 26 August 1956.]

During August 1956 the boundary between Sweden and Finland was checked and adjusted by a team including överdirektör Börje Lundgren (head of Rikets Allmänna Kartverk, the Swedish survey office) for Sweden, and General Vaala for Finland. By Finno-Swedish agreement the boundary inspection is to be carried out every 25 years, but although the last inspection took place in 1926, the operation was for various reasons postponed from 1951 to 1956. The team travelled almost entirely by boat, down the rivers Könkämä älv, Muonio älv and Torne älv, from Treriksröset in Lapland, where Finland, Sweden and Norway meet, to the Haparanda archipelago in the Gulf of Bothnia, a distance of 570 kilometres. A number of minor adjustments of the boundary were necessary, since the deepest part of the channel formed by the current in the bed of the rivers, which the boundary must follow, has shifted in some places, in one case by as much as 100 m.

## SOVIET RIVER ICE CONFERENCE, 1957

[From *Vodnyy Transport* [*Water Transport*], 18 May 1957.]

A conference on problems caused by river ice was held in Novosibirsk on 7 May 1957. The principal paper was read by I. M. Konovalov of Leningradskiy Institut Inzhenerov Vodnogo Transporta (Leningrad Institute of Water Transport Engineers). The other participants were chiefly members of institutions connected with river transport in the Ob' basin.

The importance of lengthening the navigation season was emphasized, in view of the curtailment of the season caused by construction of hydro-electric

installations. There were three ways of doing this, and none of them was used as much as it might be: use of icebreakers (existing ships of the *Volga* and *Don* type performed badly in sludge); artificial circulation of the water to hinder freezing; and use of solar radiation to speed thawing. Further study of these was urged.

Other subjects were also approved for inclusion in future research programmes. One was study of ice jams and their effect on river bed and banks. Another was the problem of establishing roads in winter on river ice. In this last case it was recognized that there was experience available on the Lena but evidently it had not yet reached the Ob'.

## LOSS OF *TERNEN* IN GREENLAND WATERS

[From the *Times*, 29 January 1957 and 4 February 1957, and *Dagens Nyheter*, 6 and 7 February 1957.]

The Danish naval cutter *Ternen* (82 tons), whose crew of eight was last heard from on 25 January 1957, was found a few days later sunk in the natural harbour of Ravns Storø, south-west Greenland. Divers who investigated the wreck concluded that the vessel had capsized suddenly as a result of heavy icing on the fore deck and port side. This seemed to be confirmed by the discovery of the bodies of two of the crew which were found in the galley where they had apparently not even had time to open the door and throw themselves overboard. The other six men could not be found. Everything on board was in order, except that the lifeboat was missing; it was thought unlikely, however, that the men would have been able to reach land in the lifeboat, on account of the very hard weather prevailing at the time. Light signals were seen from the Greenland coast about 50 km. from Ravns Storø on 4 February, but further investigations produced no results.

## CANADIAN HYDROGRAPHIC SURVEY VESSEL *BAFFIN*

[Summarized from information supplied by Canadian Vickers Ltd.]

*Baffin*, the new hydrographic survey vessel belonging to the Canadian Department of Mines and Technical Surveys, was launched on 18 June 1956. The vessel was specially designed for work in the Canadian Arctic by Milne Gilmore and German, Montreal. She is classed "For hydrographic survey service—icebreaker".

Particulars are as follows: length overall 285 ft. (87 m.); breadth moulded 49 ft. 6 in. (15 m.); deadweight tonnage 1387; gross tonnage 3460; refrigerated capacity 5000 cu.ft. (141 cu.m.); maximum thickness of plate $1\frac{1}{8}$ in. (3 cm.); frame spacing 18 in. (46 cm.) midships and 16 in. (41 cm.) fore and aft; shaft h.p. 7060; speed $15\frac{1}{2}$ knots; cruising range 1400 nautical miles (757 km.). There is a cruiser stern and a raked stem.

Propulsion is by four geared diesel Fairbanks-Morse engines of the 12 cylinder, opposed-piston, non-reversible type. Each develops 2000 B.H.P. a

about 750 r.p.m. They are connected through Hindmarch reverse reduction gears to two three-bladed propellers. There are two 400 kW. Fairbanks-Morse diesel generators.

The crow's nest is enclosed and electrically heated. The main mast is of aluminium and is mounted on a base insulator as it is used as a vertical radiating antenna for the Decca navigating equipment. The funnel contains a battery room and the Decca navigator room.

Two "Bell" helicopters are carried, and accommodated in a closed hangar which is fully equipped for their maintenance. There are six 31 ft. (9·5 m.) motor sounding launches, two aluminium life-boats, two 28 ft. (8·5 m.) landing barges and ten dories.

A hydrographic drawing office is provided on the boat deck, a plotting room on the flying bridge, and laboratories and workshops on the lower deck. There is accommodation for 102 persons, including the hydrographic staff.

# OBITUARY

Rear-Admiral Richard Evelyn Byrd died in Boston, Massachusetts, on 11 March 1957. An obituary will appear in a later number of the *Polar Record*.

Maxime Charles Lester was born on 25 September 1891, and died in London on 3 March 1957. He was trained for the Merchant Navy, and served in the Canadian and British Navies during the First World War, seeing service in the North Atlantic. In 1920 he accompanied J. L. Cope, T. W. Bagshawe, and G. H. Wilkins to Graham Land with the object of continuing the work of the Swedish South Polar Expedition 1901–03, by mapping the western coast of the Weddell Sea. They were unable to get transport to the Weddell Sea coast, but were taken by whale catchers to the Danco Coast of west Graham Land, where a camp was set up. Cope returned to Europe to try and charter a vessel for the next season, which he failed to do, and Wilkins left the expedition. Bagshawe and Lester spent the winter of 1921 in a waterboat on the beach, the smallest party ever to winter in the Antarctic. They made useful meteorological, ornithological and tidal observations, and were relieved in January 1922 by a whale catcher. Lester joined the Merchant Navy, but visited the Antarctic again in 1926–27 on the *William Scoresby*.

Commander John Hugh Mather was born at Stroud Green in 1887 and died at Farnborough, Kent, on 10 April 1957. As a junior member of the R.N.V.R., John Mather was helping to load the *Terra Nova* in the London docks in 1910. He begged to become a member of the expedition in any capacity and Scott found room for him as a member of the crew, before the mast. He served as seaman for the three years but his experience of clerical work led to his being frequently taken from that ran to help with secretarial work. This was continued at the end of the voyage and he spent much time assisting Lieut. Evans (now Lord Mountevans) in his lecture tours.

Mather served at sea in the First World War with distinction and not long after wards he conceived the idea of an Antarctic Club, restricted at first to men who had wintered inside the Antarctic Circle, or who had the Polar Medal. The club took shape in 1929 with Mather as Honorary Secretary. From that time to the end of his life he was the presiding genius of the club, re-elected Secretary by acclamation every year, and devoting all his spare time from his own profession to its interests. He knew all its members personally and was in frequent correspondence with them all over the world. He was, I believe, responsible for all the simple but effective and moving items of ritual used at the annual dinner—the President taking wine successively with each expedition represented at the dinner, the health of absent members at the striking of two bells, and the silent toast to those "who adventured to the Antarctic and did not return". For its coming-of-age dinner, the club unanimously elected him as its President, but the next year he characteristically slid back into the post of Honorary Secretary and continued to be its life and soul to within a week or so of his death.

F.J.

# RECENT POLAR LITERATURE

This selected bibliography has been prepared by R. J. Adie, Terence Armstrong, T. H. Ellison, Amorey Gethin, J. W. Glen, W. B. Harland, H. G. R. King, Brian Roberts and Ann Savours. Its main field is the polar regions, but it also includes other related subjects such as "applied" glaciology (e.g. snow ploughs and ice engineering). For the literature on the scientific study of snow and ice and of their effects on the earth, readers should consult the bibliographies in each issue of the *Journal of Glaciology*. For Russian material, the system of transliteration used is that agreed by the U.S. Board on Geographic Names and the Permanent Committee on Geographical Names for British Official Use in 1947 (see *Polar Record*, Vol. 6, No. 44, 1952, p. 546).

Reprints of "Recent Polar Literature" from Nos. 37/38 onwards can be obtained separately (to allow references to be cut out for pasting on index cards) from the Institute, price 2*s*. 6*d*. for two reprints. Copies will be sent without charge to organizations with which the Institute maintains exchange arrangements and which notify their wish to receive them. Readers can greatly assist by sending copies of their publications to the library of the Institute.

To increase the usefulness of the bibliography entries have been arranged provisionally under subject headings in classified order according to the Universal Decimal Classification. When circumstances permit the decimal notation will be included, together with a key.

## ETHNOGRAPHY. CUSTOMS. FOLKLORE

Birket-Smith, Kaj. *Mœurs et coutumes des Eskimo . . . Nouvelle edition*, Paris, Payot, 1955. 292 p. illus., map. 23 cm. [General survey of Eskimo life and culture.]

Parbøl, Inge. Qivitut, grønlandske fjeldgangsmænd. *Grønland*, 1955, Nr. 12, p. 452–63, illus. [West Greenlanders who leave community to live as hermits in mountains: legend and reality.]

De Coccola, Raymond, *and* King, Paul. *Ayorama*. Toronto, Oxford University Press [1954]. xiv, 316 p. illus., map (one on end-papers). 22½ cm. [Missionary's account of life among Copper Eskimo 1937–49. Reviewed by J. Brian Bird in *Arctic*, Vol. 8, No. 3, 1955, p. 189.]

Tugolukov, V. A. Poyezdka k okhotskim evenkam i evenam [Journey to the Okhotsk Evenki and Eveny]. *Sovetskaya Etnografiya* [*Soviet Ethnography*], 1956, No. 3, p. 142–46. [Notes on mode of life of Evenki (Tungus) and Eveny (Lamuts) made by author during visit to Okhotsk region, 1954.]

Gurvich, I. S. Eveny-Tyugyasiry, *Akademiya Nauk SSSR. Institut Etnografii imeni N. N. Miklukho-Maklaya. Kratkiye Soobshcheniya* [*Academy of Sciences of the U.S.S.R. N. N. Miklukho-Maklay Institute of Ethnography, Short Communications*], No. 25, 1956, p. 42–55, illus., map. [Material culture and way of life of Tyugyasir group of Eveny who live near lower Lena.]

Collinder, Björn. Swedish research on the language and folklore of the Lapps. *Svenska Landsmål och Svenskt Folkliv*, Årg. 79, H. 1–4 (H. 270), 1956, p. 25–50. [From 1648. Includes bibliography of printed books and articles, and of manuscripts in Uppsala University Library and at Uppsala Landsmåls- och Folkminnesarkiv.]

Manker, Ernst. *The Lapps in northernmost Sweden*. Stockholm, Svenska Turistföreningen, 1954. 46 p. illus. 15½ cm. 6.50 *Sw.Kr.* [35 photographs of Lapps, landscape and reindeer, with introduction and explanatory text. Translated from Swedish by Erik Sjögren.]

Krause, Aurel. *The Tlingit Indians: results of a trip to the northwest coast of America and the Bering Straits . . . translated by Erna Gunther*. Seattle, University of Washington Press, 1956. x, 310 p. illus., folding map. 22 cm. [Ethnological study in southeastern Alaska, 1881–82. Originally published as *Die Tlinkit Indianer*, Jena, 1885.]

Nikolayev, S. I. Gde zhili toksomskiye yakuty XVII veka [Where did the Toksoma Yakuts live in the 17th century]? *Akademiya Nauk SSSR. Institut Etnografii imeni N. N. Miklukho-Maklaya. Kratkiye Soobshcheniya* [*Academy of Sciences of the U.S.S.R. N. N. Miklukho-Maklay Institute of Ethnography. Short Communications*], No. 25, 1956, p. 56–69, map. ["Toksoma" identified with lake now called Takyma, near Lena-Vilyuy confluence.]

## GEODESY. SURVEYING

Richter, Hans. Luftbildinterpretation in den polaren Gebieten. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 301–33. [Air photography section of the Internationale Technographische Gesellschaft, Berlin.]

[Norway: Geodesy] *Norway. Report on the geodetic work executed in 1940–1953. Presented at the tenth General Assembly of the International Association of Geodesy and Geophysics in Rome 1954.* Oslo, Norges Geografiske Oppmåling, 1954. 11 p. illus., maps. 27 cm. [Work by Norges Geografiske Oppmåling and Norsk Polarinstitutt, including Svalbard and Dronning Maud Land, Antarctica.]

Arnold, K., *and* Bowater, S. Map of north-east Dronning Louise Land 1/50,000. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 213–16, map (folding at end of vol.). [Results of British North Greenland Expedition, 1952–54. Part 1: methods of construction from vertical air photography. Part 2: pilot's narrative of photographic sorties.]

Brooke, F. R. The survey of Dronning Louise Land. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 203–09, map (at end of vol.). [British North Greenland Expedition, 1952–54: surveyor's report.]

Hamilton, Richard A. Determination of the altitudes of points on the Greenland ice sheet by measurement of atmospheric pressure. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 225–30. [Methods used by British North Greenland Expedition, 1952–54. Appendix lists altitudes of seismic sounding stations on ice sheet.]

Saunders, Harold E., *and* Blodgett, Gardner D. The preparation of a reconnaissance map covering the coasts of Wilkes Land and adjacent coasts in Antarctica. *International Hydrographic Review*, Vol. 33, No. 2, 1956, p. 149–70, illus., maps. [Illustrates principles of reconnaissance mapping from air photographs in unexplored country discussed in *ibid.* Vol. 33, No. 1, 1956, p. 141–84. Map covers coastline from Lat. 66° 48′ S., Long. 89° 19′ E. to Lat. 67° 00′ S., Long. 142° 40′ E. Scale 1:1,000,000.]

Saunders, Harold E., *and* Blodgett, Gardner D. Reconnaissance mapping from aerial photographs in unexplored country. *International Hydrographic Review*, Vol. 33, No. 1, 1956, p. 141–84, illus., map. [Instructions and suggestions based on compilation of map of coast of Wilkes Land, Antarctica, described in *ibid.* Vol. 33, No. 2, 1956, p. 149–70.]

## NAVIGATION. NAUTICAL ASTRONOMY

Allen, LeRoy D. Constant compass heading for great circle navigation and the N-1 compass system. *Navigation*, Vol. 3, No. 9, 1953, p. 325–33, illus. [Navigational aid for polar regions.]

## GEOPHYSICS

Rose, D. C., *and others*. Latitude effect of the cosmic ray nucleon and meson components at sea level from the Arctic to the Antarctic, by D. C. Rose, K. B. Fenton, J. Katzman and J. A. Simpson. *Canadian Journal of Physics*, Vol. 34, No. 9, 1956, p. 968–84, map, tables. [Results of measurements aboard H.M.C.S. *Labrador*, 1954, and U.S.S. *Atka*, 1955.]

Savarenskiy, Ye. F. Izucheniye seysmichnosti trudnodostupnykh oblastey [Research on seismicity of inaccessible regions]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1956, No. 6, p. 78–81, maps. [Seismic research planned for I.G.Y.; maps showing earthquake epicentres in Arctic and Antarctic.]

Tryggvason, Eysteinn. Jarðskjálftar á Íslandi og nyrzta hluta Atlantshafsins. *Náttúrufræðingurinn*, 25. Árg., 3. Hefti, 1955, p. 194–97, map. [Epicentres of earth tremors in Iceland area and between Greenland and Norway. English summary.]

Crary, Albert P. Geophysical studies along northern Ellesmere Island. *Arctic*, Vol. 9, No. 3, 1956, p. 154–65, illus., maps. [Bathymetry, temperature and salinity, and magnetic variations, 1954. Measurements taken on ice shelf.]

Jacobs, J. A. Effect of altitude on the position of the magnetic pole. *Nature*, Vol. 178, No. 4523, 1956, p. 35–36. [Calculations at 100 km. and 250 km. above earth's surface show gradual shift in position of magnetic pole with increasing altitude.]

Saxov, Svend. Lidt om den magnetiske sydpol. *Geografisk Tidsskrift*, Bd. 54, 1955, p. 1–7, illus. [South magnetic Pole.]

Pudovkin, I. M. Magnitnyye variatsii v vysokikh shirotakh [Magnetic variation in high latitudes]. *Izvestiya Akademii Nauk SSSR. Seriya Geofizicheskaya* [*News of the Academy of Sciences of the U.S.S.R. Geophysical Series*], 1956, No. 7, p. 835–37. [Suggested causes of magnetic field variations based on recordings at scattered points.]

MIRONOVITCH, V. Les pôles de la circulation atmosphérique générale et les pôles magnétiques terrestres. *Beiträge zur Physik der Atmosphäre*, Band 29, Teil 2, 1956, p. 123–28, maps. [New data indicate probable connexion between cyclonic circulation and earth's magnetic field in the Arctic.]

[SWEDEN: MAGNETIC CHARTS] Kompassens missvisning i Sverige år 1956. *Globen*, Årg. 34, Nr. 4, 1955, p. 51, maps. [Compass variation, 1956, shown for different sections of topographical maps of Sweden.]

SLAUCITAJS, L. Mediciones geomagnéticas en la región de la peninsula antártica, islas adjacentes y Mar de Weddell en 1951–56. *Geofísica Pura e Applicata*, Vol. 35, 1956, p. 40–48, map, tables. (Contribución del Instituto Antártico Argentino, No. 3.) [Records of magnetic elements at numerous localities in Falkland Islands Dependencies, 1951–56.]

INGALL, L. N. *Magnetic results from Heard Island, 1952*. Melbourne, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics, 1955. vii, 54 p. illus., map, tables. 24 cm. (Report No. 21.) [Tabulated observations, March–December 1952.]

MCGREGOR, P. M. *Magnetic results from Macquarie Island, 1952*. Melbourne, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics, 1956. viii, 44 p. 3 plates, tables. 24 cm. (Report No. 27.) [Tabulated observations.]

## GENERAL GEOLOGY.

(See also Stratigraphy, Petrology, Economic Geology, Glacial Geology)

PEACOCK, J. D. Geology of the Britannia Sø area, Dronning Louise Land. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 210–13, map (folding, facing p. 210). [British North Greenland Expedition, 1952–54: results of author's survey.]

BERGERON, ROBERT. Preliminary report on Harveng Lake area (west half), New Quebec. *Quebec. Department of Mines. Geological Surveys Branch. Preliminary Report*, No. 320, 1956, 5 p. map (folding at end). [Results of 1955 survey.]

SAUVÉ, PIERRE. Preliminary report on Leopard Lake area (east half), New Quebec. *Quebec. Department of Mines. Geological Surveys Branch. Preliminary Report*, No. 325, 1956, 6 p. map (folding at end). [Results of 1955 survey.]

TAYLOR, ANDREW. *Physical geography of the Queen Elizabeth Islands, Canada*. New York, American Geographical Society, 1956. 12 vols. illus., maps. 27½ cm. (Contract No. Nonr-1070 (00).) [Vol. 1. Introduction: geology. Vol. 2. Glaciology. Vols. 3–10. Physiography. Vol. 11. Bibliography. Vol. 12. Maps.]

CADY, W. M., *and others*. The central Kuskokwim region, Alaska, by W. M. Cady, R. E. Wallace, J. M. Hoare and E. J. Webber. *United States Geological Survey. Professional Paper* 268, 1955, v, 132 p. illus., maps (5 in end pocket). [Detailed description of geography, geomorphology and stratigraphy. Petrology of igneous and metamorphic rocks. Special reference to mineral resources and quicksilver mining.]

DONS, JOHANNES A. Kart-katalog: Norges berggrunn. *Norges Geologiske Undersøkelse*, Nr. 193, 1956, 146 p. map. [Catalogue of bed-rock geological maps of Norway. In Norwegian and English.]

NICHOLLS, G. D. The geology of north-east Jan Mayen. *Geological Magazine*, Vol. 92, No. 2, 1955, p. 127–40, maps. [Observations on cycles of volcanic activity, 1950.]

SNYDER, GEORGE L. Eruption of Trident Volcano, Katmai National Monument, Alaska, February–June, 1953. *United States Geological Survey, Circular* 318, 1954, 7 p. map. [Account of eruption of Trident Volcano. Over 400 million cubic yards of rock material reported to have been extruded.]

PANOV, D. G. Neotektonicheskiye dvizheniya v severnoy polyarnoy oblasti [Neotectonic movements in the Arctic region]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 104, No. 3, 1955, p. 462–65, map. [Four regions distinguished, each with characteristic neotectonic movements.]

LINDSTRÖM, MAURITS. A tectonic study of Mt. Nuolja, Swedish Lapland. *Geologiska Föreningens i Stockholm Förhandlingar*, Bd. 77, Häfte 4, No. 483, 1955, p. 557–66, illus., map. [Torne lappmark.]

PANOV, D. G. O tektonicheskikh usloviyakh tsentral'noy chasti Arktiki [Tectonics of the central Arctic]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 105, No. 2, 1955, p. 339–42, map. [Tectonics of central polar basin, based on observations of Soviet drifting parties.]

RADFORTH, NORMAN W. Suggested classification of muskeg for the engineer. *Engineering Journal* (Montreal), November 1952, 4 p. illus. (Reprint.) [Discussion of problems of classifying peat-like soil conditions. System of classification outlined.]

MOIR, D. R. Beach ridges and vegetation in the Hudson Bay region. *Proceedings of North Dakota Academy of Science*, Vol. 8, 1954, [4] p. (Reprint.) [Origin of raised beaches and nature of vegetation cover.]

BRUYEVICH, S. V. K khimii osadkov Okhotskogo morya [Chemistry of bottom deposits of the Okhotsk Sea]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanology*], Tom 17, 1956, p. 41–132, maps. [Detailed study of material obtained by research ship *Vityaz'*, 1949 and 1950.]

## GLACIOLOGY

CHARLESWORTH, JOHN KAYE. *The Quaternary era with special reference to its glaciation. Vols. 1 and 2.* London, Edward Arnold, 1957. 24½ cm. 2 vols. illus., maps. [World glaciology and glacial geology; bibliography.]

ROBIN, GORDON DE QUETTEVILLE. Measurement of ice thickness in polar regions. *Times Science Review*, Spring 1957, p. 13–14, illus. [Technique of refraction and reflection shooting.]

KREUTZ, WILHELM, *and* WALTER, WOLFGANG. Der Strömungsverlauf sowie die Erosionsvorgänge und Schneeablagerungen an künstlichen Windschirmen nach Untersuchungen im Windkanal; ein Beitrag zur Windschutzfrage. *Berichte des Deutschen Wetterdienstes*, Band 4, Nr. 24, 1956, 25 p. illus. [Laboratory experiments on the use of fences as protection against snow drifting.]

WHITE, SIDNEY E. Glaciological studies of two outlet glaciers northwest Greenland, 1953. *Meddelelser om Grønland*, Bd. 137, Nr. 8, 1956, 31 p. illus., maps. [Nordre Tvillinggletscher, Søndre Tvillinggletscher, about 50 km. north-east of Dundas (formerly Thule).]

NORLING, GUNNAR. Glaciärsommar i Sarek. *Svenska Turistföreningens Årsskrift*, 1956, p. 289–308, illus., map. [Investigations of Mikka and Tjågnoris glaciers (Sarek area), north Sweden, 1954.]

KOSACK, HANS-PETER. Zur Frage des Wasserhaushalts in der Antarktis. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 286–94, map. [Recent data showing net accumulation and loss of land ice in Antarctica.]

HALLER, JOHN. Der Eisschild von Grönland. *Leben und Umwelt*, 12, 1956, p. 169–77, illus., maps. [Greenland ice sheet. Historical summary of research.]

KÜHN, ARTHUR. Neue Feststellungen über die Mächtigkeit des arktischen und antarktischen Inlandeises. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 297. [Estimates of depth of ice cap in Greenland (1948–52) and Dronning Maud Land, Antarctica, (1951–52).]

BULL, COLIN B. B. Seismic investigations on the northern part of the Greenland ice sheet. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 219–25, illus., maps. [Results of British North Greenland Expedition, 1952–54.]

LOEWE, FRITZ. *Études de glaciologie en Terre Adélie, 1951–52.* Paris, Hermann, 1956. 159 p. illus., plates, 25 cm. (*Actualités scientifiques et industrielles*, 1247; *Expéditions Polaires Françaises, Missions Paul-Emile Victor. Résultats scientifiques*, No. 9.) [Measurements of radiation balance, air and snow temperature, density, hardness, accumulation and ablation, and drifting snow in inland and coastal areas. English and German summaries, p. 137–44.]

LISTER, HAL. Glacier regime in north-east Greenland. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 230–37, illus., maps. [Dronning Louise Land. Results of British North Greenland Expedition, 1952–54.]

LILJEQUIST, GÖSTA H. Energy exchange of an antarctic snow-field. Long-wave radiation and radiation balance (Maudheim, 71° 03′ S., 10° 56′ W.). *Norwegian-British-Swedish Antarctic Expedition, 1949–52. Scientific Results*, (Oslo, Norsk Polar institutt), Vol. 2, Part 1B, 1956, 184 p. illus.

LILJEQUIST, GÖSTA H. Energy exchange of an antarctic snowfield. Short-wave radiation (Maudheim, 71° 03′ S., 10° 56′ W.). *Norwegian–British–Swedish Antarctic Expedition, 1949–52. Scientific Results*, (Oslo, Norsk Polarinstitutt), Vol. 2, Part 1A, 1956, 109 p. illus. [Solar and terrestrial radiation; reflection from and penetration into snow.]

BROWN, RICHARD. The Ross Glacier. *Nature*, Vol. 178, No. 4526, 1956, p. 192–93. [Observations on flow of glacier in South Georgia.]

SCHUSTER, R. L., *and* RIGSBY, G. P. Preliminary report on crevasses. *S*[*now*] *I*[*ce and*] *P*[*ermafrost*] *R*[*esearch*] *E*[*stablishment*] *Special Report* 11, 1954, 6 p. [General account. Appendix "crevasse accidents" by Fred Small.]

BLÜTHGEN, JOACHIM. *Die Eisverhältnisse der Kustengewässer von Mecklenburg-Vorpommern.* Remagen, Selbstverlag der Bundesanstalt für Landeskunde, 1954. 142 p. illus., maps. 23 cm. *DM.* 14.50. (*Forschungen zur Deutschen Landeskunde*, Band 85.) [Present and past ice conditions on Baltic coasts of Mecklenburg. Reviewed in *Geographical Journal*, Vol. 122, Part 2, 1956, p. 269.]

ARMSTRONG, TERENCE EDWARD. *Sea ice recording and reporting methods.* Ottawa, Defence Research Board, 1955. 53 p. 24½ cm. [Survey and recommendations.]

[FLOATING ICE: METHODS OF OBSERVING AND REPORTING] *Hydrographic Office observers' manual; ice observations. 2nd ed.* Washington, D.C., U.S. Navy Hydrographic Office, 1956. 20 p. illus. 26½ cm. 15c. (H.O. Pub. No. 606-d.) [Observational techniques and reporting procedures.]

BARLOW, E. W. The international ice nomenclature. *Marine Observer*, Vol. 26, No. 173, 1956, p. 149–50. [Background to code to be published by Commission for Maritime Meteorology of World Meteorological Organization.]

[SEA ICE] Ice. Northern North Sea. *Marine Observer*, Vol. 27, No. 175, 1957, p. 6. [Ship's report of unusual occurrence of sea ice in open sea, February 1956.]

[SEA ICE] Voyages to Churchill. *Marine Observer*, Vol. 26, No. 173, 1956, p. 161–62, table. [Ice reports from S.S. *Essex Trader* in North Atlantic Ocean, 1955 season.]

KRYNDIN, A. N. O sootnoshenii mezhdu ledovitost'yu i tolshchinoy l'da v Baltiyskom more [On the relation between quantity and thickness of ice in the Baltic]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1957, No. 2, p. 19–23. [Author shows that the thicker the ice, the greater the total area of the Baltic covered by ice.]

RODHE, BERTIL. A study of the correlation between the ice extent, the course of air temperature and the sea surface temperature in the Åland archipelago. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 141–63, illus., maps. [Baltic. Based on data 1940–54.]

WORDIE, *Sir* JAMES MANN. Ice in the Weddell Sea. *Marine Observer*, Vol. 27, No. 175, 1957, p. 31–33, illus. [Brief review of factors affecting accessibility of Coats Land, Antarctica, through Weddell Sea.]

KÜHN, ARTHUR. Eine Hypothese über die Entstehung der Eisinseln. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 294–95. [Hypothesis on the origin of Arctic "ice islands".]

GINZBURG, B. M. O metodike dolgosrochnykh prognozov zamerzaniya i vskrytiya rek [Method of long-term forecasting of freeze-up and break-up of rivers.] *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1956, No. 2, p. 10–14. [Present methods; recommended lines of future study.]

## GLACIAL GEOLOGY

MARKOV, K. K. Some data on the periglacial phenomena in the Antarctic (Preliminary report). *In: Accounts and materials of the Complex Antarctic Expedition of the USSR Academy of Sciences* (Moscow, Academy of Sciences), 1956, p. 47–54. [Glacial features of land forms in Mirnyy region, based on observations in 1955–56.]

KJARTANSSON, GUÐMUNDUR. Fróðlegar jökulrákir. *Náttúrufræðingurinn*, 25. Arg., 3 Hefti, 1955, p. 154–71, illus., maps. [Glacial striae in Iceland. English summary.]

ARNBORG, LENNART. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter VIII. Ice-marginal lakes at Hoffellsjökull, by Lennart Arnborg. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 202–28, illus., maps. [South-east Iceland. Description and history.]

JÓNSSON, JÓN. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter VIII. On the formation of frontal glacial lakes, by Jón Jónsson. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 229–33, illus. [Investigations in Iceland.]

ITSKANOV, S. R. O sledakh drevney gidrograficheskoy seti v basseyne srednego techeniya Yeniseya [On traces of the ancient hydrographic system in the basin of the middle Yenisey]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya* [*News of the Academy of Sciences of the U.S.S.R. Geographical Series*], 1956, No. 5, p. 93–96, map. [Reconstruction of river system and location of glacial lake near Podkamennaya Tunguska–Yenisey confluence.]

HJULSTRÖM, FILIP. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter IX. The ground water, by Filip Hjulström. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 234–45, illus., maps. [South-east Iceland: geomorphology, hydrology.]

HOPPE, GUNNAR, *and* LILJEQUIST, GÖSTA H. Det sista nedisningsförloppet i Nordeuropa och dess meteorologiska bakgrund. [1.] Inlandsisen och dess klimatologiska miljö, av Gunnar Hoppe, [2.] Meteorologiska synpunkter på istidsproblemet, av. G. H. Liljequist. *Ymer*, Årg. 76, Häfte 1, 1956, p. 43–74, illus., maps. [Course of last Ice Age in northern Europe and its meteorological background. English summary.]

DAHL, EILIF. Biogeographic and geologic indications of unglaciated areas in Scandinavia during the glacial ages. *Bulletin of the Geological Society of America*, Vol. 66, No. 12, Part 1, 1955, p. 1499–1520. [Age and origin of Scandinavian arctic-alpine flora and geological evidence for refuges during last glacial age.]

EWING, MAURICE, *and* DONN, WILLIAM L. A theory of ice ages. *Science*, Vol. 123, No. 3207, 1956, p. 1061–66, illus. [Major changes within the Pleistocene are ascribed primarily to ice-covered and ice-free states of Arctic Ocean and same mechanism may have operated in earlier glacial periods.]

## FROST ACTION ON ROCKS AND SOIL. PERMAFROST

JUMIKIS, A. R. Theoretical basis for frost-action research. *In: Factors related to frost action in soils*. Washington, D.C., Highway Research Board, 1955, p. 76–84. (Bulletin 111.) [Outlines need for theoretical approach and reviews principal theories.]

KERSTEN, MILES S., *and* JOHNSON, RODNEY W. Frost penetration under bituminous pavements. *In: Factors related to frost action in soils*. Washington, D.C., Highway Research Board, 1955, p. 37–62, illus. (Bulletin 111.) [Theoretical calculations of depth of frost penetration in soil.]

RADFORTH, NORMAN W. Palaeobotanical method in the prediction of sub-surface summer ice conditions in northern organic terrain. *Transactions of the Royal Society of Canada*, Vol. 48, Series 3, 1954, Section 5, p. 51–64, illus. [Active layer. Terrain classified according to types of frost phenomena.]

[PERMAFROST: BIBLIOGRAPHY] *Permafrost reference bibliography by authors and by subjects. A draft—unedited*. Boston, Mass., Arctic Construction and Frost Effects Laboratory, New England Division, 1953. 195 p. 26½ cm.

[UNION GEOGRAPHIQUE INTERNATIONALE] Rapports de la Commission de Morphologie Périglaciaire de l'U.G.I. *Biuletyn Peryglacjalny* [*Periglacial Bulletin*], Nr. 4, 1956, p. 3–168, illus. [Reports presented at 1956 meeting in Rio de Janeiro on periglacial research in Canada, Japan, U.S.S.R., Svalbard and Lapland, Sweden, Poland, Holland, Belgium, the British Isles, France, Switzerland, Algeria, Morocco and Australia.]

CORBEL, JEAN. Svalbard et Laponie. Phénomènes périglaciaires au Svalbard et en Laponie. *Biuletyn Peryglacjalny* [*Periglacial Bulletin*], Nr. 4, 1956, p. 47–54. [Review article on periglacial forms in Svalbard and Lapland. Bibliography.]

SMITH, J. Some moving soils in Spitsbergen. *Journal of Soil Science*, Vol. 7, No. 1, 1956, p. 10–21, illus., plate. [Soil survey by Aberdeen Spitsbergen Expedition in central Vestspitsbergen, July–August, 1954.]

[FROST ACTION ON ROCKS AND SOIL] URSS. Bibliographie concernant les formations périglaciaires et le pergélisol en URSS. *Biuletyn Peryglacjalny* [*Periglacial Bulletin*], Nr. 4, 1956, p. 37–46. [Bibliography of 152 entries of Russian work on periglacial subjects both in arctic and on fossil forms. All titles are provided with translation to one Western language. Compiled by the Geographical Institute of the Academy of Sciences.]

HOPPE, GUNNAR. Suède. *Biuletyn Peryglacjalny* [*Periglacial Bulletin*], Nr. 4, 1956, p. 55. [Short review of periglacial phenomena in Sweden.]

WASHBURN, A. LINCOLN. Classification of patterned ground and review of suggested origins. *Bulletin of the Geological Society of America*, Vol. 67, 1956, p. 823–66, illus.

GRAVE, N. A. Ob arkheologicheskoy datirovke vozrasta nekotorykh gidrolakkolitov na Chukotke [Archaeological determination of age of some hydrolaccoliths in Chukotka]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 106, No. 4, 1956, p. 706–07. [Archaeological site found on top of pingo enables lower age limit to be fixed.]

COOK, FRANK A. Near surface soil temperature measurements at Resolute Bay, Northwest Territories. *Arctic*, Vol. 8, No. 4, 1955, p. 237–49, illus. [Permafrost. 1950–55 data analysed.]

MISENER, A. D., *and others*. Heat flow measurements in permafrost at Resolute Bay, Northwest Territories, by A. D. Misener, P. C. Bremner and J. H. Hodgson. *Journal of the Royal Astronomical Society of Canada*, Vol. 50, No. 1, p. 14–24, illus. [Analysis of temperatures measured in bore holes up to 650 ft. deep, 1950–53.]

POPOV, A. I. Proiskhozhdeniye i razvitiye moshchnogo iskopayemogo l'da [Origin and development of thick fossil ice]. *Materialy k osnovam ucheniya o merzlykh zonakh zemnoy kory* [*Materials on the principles of study of the frozen zones of the earth's crust*], Vypusk 2, 1955, p. 5–24, illus. [Relation between age of ice found in permafrost and age of surrounding soil.]

## PHYSICAL GEOGRAPHY. GEOMORPHOLOGY

IVES, J. D., *and* KING, CUCHLAINE A. M. Geomorphological observations in N.W. Öraefi, Iceland. *Survey*; (Nottingham University), Vol. 4, No. 3, 1954, p. 18–28, illus., map. [Results of Nottingham University Expedition, 1953.]

VOSKRESENSKIY, S. S. *Geomorfologiya Sibiri. Kurs lektsiy. Zapadnaya Sibir'* [*Geomorphology of Siberia. Course of lectures. Western Siberia*]. Moscow, Moskovskiy Gosudarstvennyy Universitet im. M. V. Lomonosova. Geograficheskiy Fakul'tet. Kafedra Geomorfologii [M. V. Lomonosov Moscow State University. Geographical Faculty. Chair of Geomorphology], 1956. 107 p. map. [Includes lower Ob' region.]

ALBERTS, FRED, *and* BLODGETT, GARDNER. The Bunger Hills area of Antarctica. *Professional Geographer*, Vol. 8, No. 3, 1956, p. 13–15, map. [General description of ice-free area in Queen Mary Land.]

KING, CUCHLAINE AUDREY MURIEL. The coast of south-east Iceland near Ingólfshöfði. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 241–46, maps. [Development of an off-shore bar coast explained. Reply by W. Vaughan Lewis, *ibid.* Part 4, p. 538–40, and author's further reply, *ibid.* Part 4, p. 540.]

## OCEANOGRAPHY. HYDROGRAPHY. HYDROLOGY

DUNBAR, MAXWELL JOHN. Russian plans for the Ob' and Yenisey and the Bering Strait. *Arctic*, Vol. 8, No. 4, 1955, p. 259–61. [Comment on possible results of supposed plan to pump Pacific water from Bering Sea to polar basin.]

VILLEGAS CAMPOS, GUILLERMO. Las Mareas de la Antártica. *Revista de Marina* (Santiago), Vol. 72, No. 595, 1956, p. 692–98, diagrs. [Tidal measurements at Chilean base Arturo Prat, Greenwich Island, South Shetland Islands, December 1955–January 1956.]

KORT, V. G. Okeanograficheskiye issledovaniya v antarktike [Oceanographical investigations in the Antarctic]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1956, No. 6, p. 82–88. [Work done in March 1956 from *Ob'* in antarctic coastal waters between 91° and 162° E. long.]

KORT, V. G. Report on the naval antarctic expedition of the U.S.S.R. Academy of Sciences. *In: Accounts and materials of the Complex Antarctic Expedition of the USSR Academy of Sciences* (Moscow, Academy of Sciences), 1956, p. 40–46. [Preliminary oceanographical results of cruise of *Ob'* in Southern Ocean, 1955–56.]

[EXPEDITIONS: ANTARCTIC] *Field report. Oceanographic observations U.S. Navy antarctic expedition 1954–55. U.S.S. Atka (A.G.B-3).* Washington, D.C., U.S. Navy Hydrographic Office, 1956. [97] p. illus. 27 cm. (H.O. Misc. 16331.) [Summary and results of oceanographic operations in Ross Sea and Weddell Sea.]

ELLIS, D. V. Some temperature and salinity records from the Canadian Arctic during 1954 and 1955. *Journal of the Fisheries Research Board of Canada*, Vol. 13, No. 4, 1956, p. 591–98, tables, map. [From 14 oceanographic stations between Cambridge Bay and north Baffin Island.]

BRUYEVICH, S. V. Khimicheskiye issledovaniya Instituta okeanologii AN SSSR na dal'nevostochnykh moryakh i v prilegayushchey chasti Tikhogo okeana [Chemical investigations of the Institute of Oceanology of the Academy of Sciences of the U.S.S.R. in Far Eastern seas and the adjoining part of the Pacific Ocean.] *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanology*], Tom 17, 1956, p. 18–40. [Chemistry of sea water and bottom deposits; samples collected by research ship *Vityaz'*, 1949–55.]

MOKIYEVSKAYA, V. V. Nekotoryye dannyye po khimii biogennykh elementov Beringova morya [Some data on the chemistry of biogenous elements of the Bering Sea]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanology*], Tom 17, 1956, p. 176–91. [Based on water samples taken at all seasons during 1950–53.]

COOPER, L. H. N. Deep water movements in the North Atlantic as a link between climatic changes around Iceland and biological productivity of the English Channel and Celtic sea [*sic*]. *Sears Foundation. Journal of Marine Research*, Vol. 14, No. 4, 1955, p. 347–62, illus. [Traces movement of cold water formed over Faroe-Iceland Ridge to western basin of Atlantic.]

ARNBORG, LENNART. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter VII. Hydrology of the glacial river Austurfljót, by Lennart Arnborg. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 185–201, illus., map. [South-east Iceland. Observations in 1951–52.]

## METEOROLOGY. CLIMATOLOGY

GARRIOCK, A. Southern hemisphere meteorology. *Navigation*, Vol. 5, No. 3, 1956, p. 147–49 [General account. Includes antarctic organization and stations.]

BELLAMY, JOHN C. The role of the navigator in the International Geophysical Year. *Navigation*, Vol. 5, No. 3, 1956, p. 149–54. [To obtain aircraft observations of meteorological conditions in various ways.]

VILLENEUVE, G.-OSCAR. Instructions météorologiques spéciales à l'usage des explorateurs. *Québec. Ministère des Terres et Forêts. Bureau de Météorologie.* Bulletin No. 22, 1952, [i], 14 p. [Practical notes on meteorological observations to be combined with other work.]

SUNDBORG, ÅKE. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter VI. Meteorological observations, by Åke Sundborg. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 176–84, illus., maps. [South-east Iceland. Observations at Hólar, June 1951 to August 1952 and Hoffell, June to August 1951.]

DINGLE, W. J. R. Extract from report on year's operation at Mawson. *Australian Meteorological Magazine*, No. 10, 1955, p. 57–70, illus. [Summary of activities and observations.]

VENTER, R. J. Meteorological data for the southern oceans: distribution with respect to time and region. *Notos*, Vol. 5, No. 1, 1956, p. 12–52, maps, diagrs. [Analysis of ships' observations 1920–55 south of lat. 50° S. to show availability of data.]

FRASER, RONALD. *Regard the earth: the story of the International Geophysical Year 1957–58.* London, Junior Art Club Publications, [1957]. 24 p. illus., map. 24 cm. 2*s.* 6*d.* (Science Club Publication.) [Scientific programme outlined.]

JONES, *Sir* HAROLD SPENCER. The International Geophysical Year. *Journal of the Institute of Navigation*, Vol. 10, No. 1, 1957, p. 17–30. [Outline of programme.]

LILJEQUIST, GÖSTA H. Inför de Internationella Geofysiska Året 1957–58. *Ymer*, Årg. 76, Häfte 4, 1956, p. 273–93, illus., maps. [Purposes, plans and organization of International Geophysical Year, 1957–58; Swedish station planned at Murchisonfjorden, Nordaustlandet, Svalbard.]

KRASOVSKIY, V. I. Izucheniye neba i polyarnykh siyaniy (iz programmy Mezhdunarodnogo geofizicheskogo goda) [Study of sky and aurora (from the programme of the International Geophysical Year)]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1956, No. 5, p. 29–31. [Soviet plans.]

DALZIEL, K. Rawin measurements at Heard Island. *Australian Meteorological Magazine*, No. 10, 1955, p. 47–56, illus. [Radio-theodolite described and discussed.]

[WIRELESS TRANSMISSION OF SYNOPTIC MESSAGES: ANTARCTICA] *Weather messages.* Stanley, Falkland Islands and Dependencies Meteorological Service, 1957. 8 p. 34½ cm. [Details of collective synoptic messages and forecasts issued from Falkland Islands and Dependencies.]

BRITTON, G. P., *and* LAMB, H. H. A study of the general circulation of the atmosphere over the far south. *Weather*, Vol. 9, No. 9, 1956, p. 281–91; Vol. 11, No. 11, 1956, p. 339–54, illus., maps. [Includes study of synoptic analyses made by Royal Naval Weather Centre (Simonstown) of antarctic and sub-antarctic observational data, 1946–47, 1947–48.]

ROUCH, JULES. L'Antarctide Américaine (étude Météorologique). *Bulletin de l'Institut Océanographique*, Vol. 54, No. 1095, 1957, 20 p. maps. [General circulation of the atmosphere, Falkland Islands Dependencies.]

GARRIOCK, A. Cross-section of Southern Ocean cyclone from observations at Kerguelen and Heard Islands. *Australian Meteorological Magazine*, No. 10, 1955, p. 71–74, map. [2 January 1954.]

BRADBURY, DOROTHY L., *and* PALMÉN, E. On the existence of a polar-front zone at the 500-mb level. *Bulletin of the American Meteorological Society*, Vol. 34, No. 2, 1953, p. 56–62, maps, diagrs. [Examples cited. Value in weather forecasting.]

GORSHKOV, V. E. K voprosu o zimnem fronto- i tsiklogeneze v severnoy chasti Okhotskogo morya [On winter fronto- and cyclogenesis in the northern part of the Okhotsk Sea]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1957, No. 1, p. 36–37. [Characteristics of winter monsoon found.]

LOON, H. VAN. Description of a blocking situation in the central South Atlantic Ocean (April 29–May 11, 1956). *Notos*, Vol. 5, No. 2, 1956, p. 117–19, maps. [Synoptic charts and pressure maps made from surface data illustrate a rare occurrence in this region.]

DEPERCIN, FERNAND, *and* FALKOWSKI, SIGMUND. Frequencies of selected low temperatures in Alaska. *Monthly Weather Review*, Vol. 84, No. 6, 1956, p. 207–18, maps. [Tables and maps of frequency of maximum or minimum temperatures being below various given temperatures for 30 stations throughout Alaska.]

LILJEQUIST, GÖSTA H. Energy exchange of an antarctic snow-field. Surface inversions and turbulent heat transfer (Maudheim, 71° 03′ S., 10° 56′ W.). *Norwegian–British–Swedish Antarctic Expedition, 1949–52. Scientific Results*, (Oslo, Norsk Polarinstitutt), Vol. 2, Part 1D, 1957, p. 235–98, illus.

HISDAL, V., *and others.* Surface observations. Air pressure (Maudheim, 71° 03′ S., 10° 56′ W.), [by] V. Hisdal, O. Amble and Nils Jørgen Schumacher. *Norwegian–British–Swedish Antarctic Expedition, 1949–52. Scientific Results*, (Oslo, Norsk Polarinstitutt), Vol. 1, Part 2A, 1956, 64 p. illus.

Shaw, P. J. R. Some effects of topography on weather observations at Heard Island. *Australian Meteorological Magazine*, No. 10, 1955, p. 34–46, illus., maps. [Extent to which wind observations can be regarded as representative and not purely local.]

Liljequist, Gösta H. Energy exchange of an antarctic snow-field. Wind structure in the low layer (Maudheim, 71° 03′ S., 10° 56′ W.). *Norwegian–British–Swedish Antarctic Expedition, 1949–52. Scientific Results*, (Oslo, Norsk Polarinstitutt), Vol. 2, Part 1C, 1957, p. 185–234, illus.

Coxon, A. Frost smoke. *Marine Observer*, Vol. 26, No. 173, 1956, p. 163–65. [Occurrence reported in English Channel, February 1956. Comment by R. F. M. Hay.]

Thuman, William C., *and* Robinson, Elmer. Studies of Alaskan ice-fog particles. *Journal of Meteorology*, Vol. 11, No. 2, 1954, p. 151–56, illus. [Investigation at Eielson Air Force Base, near Fairbanks, 1952–53.]

Robinson, Elmer, *and* Bell, Gordon B. Low-level temperature structure under Alaskan ice fog conditions. *Bulletin of the American Meteorological Society*, Vol. 37, No. 10, 1956, p. 506–13, illus. [Results of studies at Fairbanks, winters 1952–53, 1953–54.]

Mannerfelt, Carl M:son. Snö. *Svenska Turistföreningens Årsskrift*, 1955, p. 140–58, illus. [Snow: its nature, surface forms, crystals.]

Walsh, K. J. Occurrence of blowing snow on the Greenland ice cap during 1953–54. *S[now] I[ce and] P[ermafrost] R[esearch] E[stablishment] Special Report 13*, 1954, 6 p. illus. 24½ cm. [Tabulated results for two sites, 1953–54.]

Codd, Ashton R., *and* Nelson, Morlan W. Use of aircraft in snow surveying. *Proceedings. Western Snow Conference*, Twenty-second annual meeting, April 19–21, 1954.... p. 83–85. [Practical considerations and costs.]

[Snow Cover Optics] *Final progress report snow characteristic project, contract no. DA–11–190–ENG–3 8–66–02–001.* Berkeley, University of California, Institute of Engineering Research, 1955. 122 leaves. illus. 27½ cm. (Snow Ice and Permafrost Research Establishment, U.S. Army, Corps of Engineers, Report 16.) [Spectral reflectivity and reflectance measurements with object of developing camouflage and detection techniques in snow-covered areas.]

Henderson, Thomas J. The use of aerial photographs of snow depth markers in water supply forecasting. *Proceedings. Western Snow Conference*, Twenty-first annual meeting, April 20–22, 1953... p. 44–47, illus. [Markers set up in Sierra Nevada, 1949–52.]

[Water Supply from Snow Cover] *Summary report of the snow investigations. Snow hydrology.* Portland, Oregon, U.S. Army Corps of Engineers, North Pacific Division, 1956. xxvi, 437 p. illus. (plates). 26½ cm. [Theoretical and practical text-book from engineering point of view.]

Fristrup, Børge. Klimatologische Untersuchungen im nördlichen Teil Grönlands. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 314–15. [Climatological conditions in Pearyland, north Greenland.]

Corbel, Jean. L'hiver dans l'Arctique nord-américain (de l'Alaska au Groenland). *Revue Canadienne de Géographie*, Vol. 10, Nos. 2–3, 1956, p. 81–96, maps, diagr. [Winter climate of North American Arctic and Greenland.]

[Sweden: Climate] Vintern. *Svenska Turistföreningens Årsskrift*, 1955, 324 p. illus., maps. [23 articles on various aspects of winter in Sweden, effects on nature and community, especially in north Sweden. Richly illustrated.]

Thomson, Andrew. The climate of the Hudson Bay Region. *Transactions of the Royal Society of Canada*, Third Series, Vol. 48, Oceanographic Session, 1954, p. 1–7, map. [Discussion of climate and sea ice conditions in Hudson Bay region.]

Potzger, J. E., *and* Courtemanche, Albert. A series of bogs across Quebec from the St Lawrence Valley to James Bay. *Canadian Journal of Botany*, Vol. 34, No. 4, 1956, p. 473–500, illus. [Results of borings to determine climatic changes from pollen profiles.]

Bristow, G. C. How cold is it? *Weekly Weather and Crop Bulletin National Summary* (Washington, D.C.), November 28, 1955, illus. (Reprint.) [Evaluation of wind-chill factor.]

Utterström, Gustaf. Climatic fluctuations and population problems in early modern history. *Scandinavian Economic History Review*, Vol. 3, No. 1, 1955, p. 3–47. [Includes discussion of Greenland, Iceland, Scandinavia.]

Miller, David H. The influence of snow cover on climate in Greenland. *Bulletin of the American Meteorological Society*, Vol. 35, No. 2, 1954, p. 90. [Abstract.]

Fiske, C. O. White-out—a polar weather phenomenon. *United States Naval Institute Proceedings*, Vol. 82, No. 9, 1956, p. 954–59, illus. [Causes and operational hazard discussed.]

Wallerstein, George. Refraction observations on the Greenland ice cap. *Navigation*, Vol. 5, No. 3, 1956, p. 138–40, tables. [Made from Thule to "Station Centrale" of Expéditions Polaires Françaises, 1955.]

LILJEQUIST, GÖSTA H. Special studies. Halo-phenomena and ice-crystals (Maudheim, 71° 03′ S., 10° 56′ W.). *Norwegian–British–Swedish Antarctic Expedition, 1949–52. Scientific Results* (Oslo, Norsk Polarinstitutt), Vol. 2, Part 2A, 1956, 85 p. illus.

BAGARYATSKIY, B. A., *and* FEDOROVA, N. I. Spektr polyarnykh siyaniy v oblasti 9000–10500 Å [Auroral spectrum in the region of 9000–10500 Å]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 103, No. 6, 1955, p. 1009–11, illus. [Analysis of 4 spectra photographed in March 1954.]

## STRATIGRAPHY. PETROLOGY

JÓNSSON, JÓN. The Hoffellssandur—a glacial outwash plain, by Filip Hjulström, Åke Sundborg, Lennart Arnborg, Jón Jónsson. Part II. Chapter V. Tillite in the basalt formation in east Iceland, by Jón Jónsson. *Geografiska Annaler*, Årg. 37, Häfte 3–4, 1955, p. 170–75, illus. [Stratigraphical determination.]

KURTZ, V. E., *and others*. Stratigraphy of the Dundas Harbour area, Devon Island, Arctic Archipelago, by V. E. Kurtz, A. H. McNair and D. B. Wales. *American Journal of Science*, Vol. 250, No. 9, 1952, p. 636–55, illus., map. [Cambrian and Ordovician rocks: six formations described. Results of 1949 field work.]

BUDDING, A. J. The geology of the Settee Lake area. (East half.) *Saskatchewan Department of Mineral Resources, Geology Branch, Report* No. 17, 1955, 19 p. illus., map (in end pocket). [Brief account of regionally metamorphosed Precambrian sediments and volcanics intruded by granites and diorites.]

FAHRIG, W. F. Lac Herodier map-area, New Quebec (descriptive notes). *Geological Survey of Canada. Paper* 55–1, 1955, 10 p. map (in end pocket). [Description of Precambrian stratigraphy. Copper, iron and lead occurrences noted.]

HOADLEY, J. W. Abitau Lake, District of MacKenzie, Northwest Territories (map with marginal notes). *Geological Survey of Canada. Paper* 55–10, 1955, map (in end pocket). [Descriptive notes on Archean geology.]

## ECONOMIC GEOLOGY. MINERALS

HALE, W. E. Forcie Lake map-area, Saskatchewan (map with marginal notes). *Geological Survey of Canada, Paper* 55–4, 1955, map (in end pocket). [Descriptive notes on Precambrian stratigraphy, with reference to mineral deposits.]

KINDLE, E. D. Keno Hill, Yukon Territory (map with marginal notes). *Geological Survey of Canada. Paper* 55–12, 1955, map (in end pocket). [Descriptive notes on Precambrian and Palaeozoic geology, with special reference to silver, lead, zinc and cadmium deposits.]

POOLE, W. H. Wolf Lake, Yukon Territory (preliminary map with marginal notes). *Geological Survey of Canada. Paper* 55–21, 1955, map (in end pocket). [Brief descriptive notes on Palaeozoic, Mesozoic and Cenozoic geology in relation to mineral occurrences.]

PAVLOVSKIY, YE. V., *and* FLORENSOV, N. A. Nedra vostochnoy Sibiri [Mineral wealth of eastern Siberia]. *Priroda* [*Nature*], 1956, No. 12, p. 3–13, illus. [Outline of economic geology of area between Yenisey and Lena.]

OLSACHER, JUAN. Breves observaciones geológicas en Puerto Paraíso, Península Antártica. *Universidad Nacional de Cordoba, Museo de Mineralogía y Geología, Comunicaciones* 29, 1956, 8 p. illus. (Contribución No. 9 del Instituto Antártico Argentino.) [Mineralogical investigations by author at Argentine base "Almirante Brown", Paradise Harbour, Danco Coast, west Graham Land.]

KENNEDY, GEORGE C. Geology and mineral deposits of Jumbo Basin, southeastern Alaska. *United States Geological Survey Professional Paper* 251, iv, 46 p. illus., maps (in end pocket). $1. [Discussion of the contact metamorphism, magnetite deposits, and iron ore reserves of part of Prince of Wales Island: results of U.S. geological survey, 1944.]

[ANTARCTIC: MINERAL RESOURCES] Minerals of the Antarctic. *Mining Journal*, 3 February, 1956, p. 149–50, map. [General account.]

CHAPMAN, ROBERT MILLS, *and* SAUNDERS, ROBERT H. The Kathleen-Margaret (K-M) copper prospect on the Upper Maclaren River, Alaska. *United States Geological Survey. Circular* 332, 1954, ii, 5 p. maps. [Of the several cupriferous veins discovered only one is minable. Richest part of vein assayed is 30 to 45 % copper, but 3·5 to 12·5 % copper is more usual.]

WEDOW, HELMUTH, *jr., and others*. Reconnaissance for radioactive deposits in eastern interior Alaska, 1946, by H. Wedow, *jr.*, P. L. Killeen and others. *United States Geological Survey. Circular* 331, 1954, ii, 36 p. maps. [Prospecting failed to disclose bedrock occurrences of previously reported radioactive minerals in placers.]

WEDOW, HELMUTH, *jr., and others.* Reconnaissance for radioactive deposits in east-central Alaska, 1949, by H. Wedow, *jr.*, M. G. White and others. *United States Geological Survey. Circular* 335, 1954, 22 p. maps (2 in end pocket). [No exceptional radioactive mineral deposits revealed. Both bedrock and alluvial prospecting carried out.]

WEST, WALTER SCOTT. Reconnaissance for radioactive deposits in the Lower Yukon–Kuskokwim region, Alaska, 1952. *United States Geological Survey. Circular* 328, 1954, 10 p. maps (2 in end pocket). [No major radioactive occurrences reported.]

GRYC, GEORGE, *and others.* Alaska, by G. Gryc, Don J. Miller and Thomas G. Payne. *Bulletin of the American Association of Petroleum Geologists*, Vol. 35, No. 2, 1951, p. 151–68, maps. [Mineral oil resources.]

## PALAEONTOLOGY

IMLAY, RALPH W. Callovian (Jurassic) ammonites from the United States and Alaska. Part 2. Alaska Peninsula and Cook Inlet regions. *United States Geological Survey. Professional Paper* 249–B, 1953, iii, p. 41–108, plates, illus. $1.75. [Cephalopods collected by U.S. Geological Survey, 1903–48. Includes comparison with other faunas.]

IMLAY, RALPH W. Characteristic Jurassic mollusks from northern Alaska. *United States Geological Survey. Professional Paper* 274-D, 1955, p. 69–96, 6 plates, folding diagram in pocket. [Systematic description of Jurassic Mollusca, stratigraphic positions of which are determined.]

MARTINSON, G. G. *Opredelitel' mezozoyskikh i kaynozoyskikh presnovodnykh mollyuskov vostochnoy Sibiri* [*Classified list of Mesozoic and Caenozoic fresh water molluscs of eastern Siberia*]. Moscow, Leningrad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1956, 92 p. illus. 26 cm. [First attempt to produce classified list of species found.]

## BIOLOGY. ARCHAEOLOGY. ANTHROPOLOGY

[DENMARK: NATIONALMUSEET] Nationalmuseets etnografiske Samling 1955. *Geografisk Tidsskrift*, Bd. 55, 1956, p. 181–94, illus. [Additions (including Eskimo) to Danish Nationalmuseet's ethnographic collection; Danish archaeological investigations in Greenland, 1955.]

COLLINS, HENRY B. The T1 site at Native Point, Southampton Island, N.W.T. *Anthropological Papers of the University of Alaska*, Vol. 4, No. 2, 1956, p. 63–89, illus. [Description of flint artifacts and other remains excavated 1954–55.]

MACNEISH, RICHARD S. The Engigstciak site on the Yukon arctic coast. *Anthropological Papers of the University of Alaska*, Vol. 4, No. 2, 1956, p. 91–111, illus., map. [Preliminary results of excavations in Frith River area.]

OSBORNE, DOUGLAS, *and others.* The problem of northwest coastal interior relationships as seen from Seattle, by Douglas Osborne, Warren W. Caldwell and Robert H. Crabtree. *American Antiquity*, Vol. 22, No. 2, 1956, p. 117–28. [Discussion of Charles Borden's theories on British Columbian pre-history.]

MARSH, GORDON H. A stone lamp from Yukon Island, Alaska. *Anthropological Papers of the University of Alaska*, Vol. 4, No. 2, 1956, p. 113–15, illus. [Early Eskimo–Aleut style. Found by chance 1955.]

SIMONSEN, POVL. Helleristninger ved Tromsø. *Ottar*, Nr. 5, 1955, 30 p. illus., map. [Rune stones in Tromsø district, north Norway.]

DEBETS, G. F. Drevniy cherep iz Yakutii [Ancient skull from Yakutiya]. *Akademiya Nauk SSSR. Institut Etnografii imeni N. N. Miklukho-Maklaya. Kratkiye Soobshcheniya* [*Academy of Sciences of the U.S.S.R. N. N. Miklukho-Maklay Institute of Ethnography. Short Communications*], No. 25, 1956, p. 60–63. [Description of skull found at Tuoy-Khaya in 1954.]

MCBEE, R. H., *and* GAUGLER, LORRAINE P. Identity of thermophilic bacteria isolated from arctic soils and waters. *Journal of Bacteriology*, Vol. 71, No. 2, 1956, table. [Point Barrow, Alaska. Fifteen cultures identified.]

MCBEE, R. H., *and* MCBEE, VIRGINIA H. The incidence of thermophilic bacteria in arctic soils and waters. *Journal of Bacteriology*, Vol. 71, No. 2, 1956, tables. [Analysis of soil and water samples from Point Barrow, Alaska.]

WIBORG, KRISTIAN FREDRIK. Zooplankton in relation to hydrography in the Norwegian Sea. *Fiskeridirektoratets Skrifter. Serie Havundersøkelser*, Vol. 9, No. 4, 1955, 66 p. illus., maps. [Also Greenland Sea. Based on samples taken from vessels of Norwegian Fishery Research Institute, 1948–54.]

## BOTANY

RITCHIE, J. C. The native plants of Churchill, Manitoba, Canada. *Canadian Journal of Botany*, Vol. 34, No. 2, 1956, p. 269–320, map, diagr. [Complete annotated catalogue, with notes on geology and climate.]

TIKHOMIROV, B. A. Sovremennoye sostoyaniye rastitel'nogo pokrova kraynego severa SSSR i ocherednyye problemy yego izucheniya [Present state of vegetation of the far north of the U.S.S.R. and current problems in its study]. *Botanicheskiy Zhurnal* [*Botanical Journal*], Tom 40, No. 4, 1955, p. 508–27. [Summary of present state of knowledge.]

[SOVIET ARCTIC: BOTANY] *Katalog semyan, predlagayemykh dlya obmena Polyarno-alpiyskim botanicheskim sadom gorod Kirovsk Murmanskoy Oblasti. No. 12* [*Catalogue of seeds offered for exchange by the polar and alpine botanical garden, Kirovsk, Murmanskaya Oblast' No. 12*]. Moscow, Leningrad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1956. 36 p. 22½ cm.

TIKHOMIROV, B. A. Vliyaniye obskogo lemminga (Lemmus obensis Brants) na rastitel'nyy pokrov tundry [Influence of the Ob' lemming (*Lemmus obensis* Brants) on the vegetation of the tundra]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 104, No. 4, 1955, p. 650–52. [Investigations made by author in Taymyr in 1948.]

CHURCHILL, ETHAN D. Phytosociological and environmental characteristics of some plant communities in the Umiat region of Alaska. *Ecology*, Vol. 36, No. 4, 1955, p. 606–27, illus. [Interrelationship of five types of plant community studies 1951.]

CLEVE-EULER, ASTRID. Ishavsväxternas väg till Östersjön. Några anmärkningar. *Acta Societatis pro Fauna et Flora Fennica*, 72, N:o 3, 1955, 12 p. map. [Theory of how flora on Arctic Ocean coasts of Scandinavia spread to Baltic.]

LINGSTONE, D. A. Some pollen profiles from arctic Alaska. *Ecology*, Vol. 36, No. 4, 1955, p. 587–600, illus. [Results of analysis of five cores from the central part of Brooks Range.]

HULTÉN, ERIC. The isolation of the Scandinavian mountain flora. *Acta Societatis pro Fauna et Flora Fennica*, 72, No. 8, 1955, 22 p. maps. [Analysis and cause of distribution of Scandinavian and corresponding north Russian plants.]

CEDERCREUTZ, CARL. Vergleich zwischen der Algenvegetation an den Felsen Süd- und Mittelfinnlands und an den Felswänden in der alpinen Region Lapplands. *Acta Societatis pro Fauna et Flora Fennica*, 72, N:o 2, 1955, 21 p. [Species of algae on walls of rock in alpine region of Lapland, compared with those on rocks in south and central Finland.]

ANDREYEV, V. N. Prirost kormovykh lishaynikov i priyemy yego regulirovaniya [Growth of lichens edible for reindeer and ways of regulating it]. *Trudy Botanicheskogo Instituta im. V. L. Komarova Akademii Nauk SSSR. Seriya III* (*Geobotanika*) [*Transactions of the V. L. Komarov Botanical Institute of the Academy of Sciences of the U.S.S.R. Series 3* (*Geobotany*)], Vypusk 9, 1954, p. 11–74, illus. [Detailed study on *Cladonia* sp.]

WADE, A. E. The mosses and lichens of Isersiutilik, west Greenland. *Bryologist*, Vol. 57, No. 3, 1954, p. 225–29. [List. Results of Oxford University expedition, 1928.]

THOMSON, JOHN W. Lichens of arctic America. 2. Additions to records of lichen distribution in the Canadian eastern Arctic. *Bryologist*, Vol. 58, No. 3, 1955, p. 246–61. [Annotated list.]

THOMSON, JOHN W. Lichens of arctic America. 3. A collection of lichens from Southampton Island, by J. C. Ritchie. *Bryologist*, Vol. 59, No. 3, 1956, p. 222–26. [Annotated list.]

EVANS, ALEXANDER W. Notes on north American Cladoniae. *Bryologist*, Vol. 58, No. 2, 1955, p. 93–112. [Includes some Alaskan lichens.]

PERSSON, HERMAN. Mosses of Alaska–Yukon. *Bryologist*, Vol. 57, No. 3, 1954, p. 189–217. [Annotated list.]

SHERRARD, ELIZABETH M. Bryophytes of Alaska. 1. Some mosses from the southern slopes of the Brooks Range. *Bryologist*, Vol. 58, No. 3, 1955, p. 225–36. [Annotated list.]

ELLIS, D. V. Some observations on the shore fauna of Baffin Island. *Arctic*, Vol. 8, No. 4, 1955, p. 224–36, illus., maps. [Results of studies, 1953, by author and V. C. Wynne-Edwards, on east coast of Baffin Island.]

## ZOOLOGY

EGDAHL, RICHARD H., *and* RICHARDS, JOHN B. *Some physiological observations in the bear with emphasis on adrenal cortical function in hypothermia.* Bethesda, Maryland, Naval Medical Research Institute, 1955. [6] p. table. 26½ cm. (Memorandum Report 55–3.) [Study of blood of *Ursus americanus* and its role in hibernation.]

MacGinitie, G. E. Distribution and ecology of the marine invertebrates of Point Barrow, Alaska. *Smithsonian Miscellaneous Collections*, Vol. 128, No. 9, 1955, 201 p. illus., maps. (Publication 4221.) [Results of author's field studies, summer 1948, and 1949–50.]

Berkeley, E., *and* Berkeley, C. On a collection of Polychaetous Annelids from northern Banks Island, from the south Beaufort Sea, and from northwest Alaska; together with some new records from the east coast of Canada. *Journal of the Fisheries Research Board of Canda*, Vol. 13, No. 2, 1956, p. 233–46, table. [Annotated list of 37 species.]

Pettibone, Marian H. Marine polychaete worms from Point Barrow, Alaska, with additional records from the North Atlantic and North Pacific. *Proceedings of the United States National Museum*, Vol. 103, No. 3324, 1954, p. 203–356, illus. [Report based on material in U.S. National Museum, collected by G. E. MacGinitie and others.]

Tambs-Lyche, Hans. Norges matnyttige fisk. *Fiskeridirektoratets Skrifter. Serie: Fiskeri*, Vol. 3, No. 4, 1955, 132 p. map. [Biology, distribution, catch figures, of fish and crustaceans important for Norway's economy.]

Marshall, S. M. On the biology of *Calanus finmarchicus*. 9. Feeding and digestion in the young stages. *Journal of the Marine Biological Association of the United Kingdom*, Vol. 35, No. 3, 1956, p. 587–603, illus. [Laboratory experiments.]

Salzen, E. A. The density of the eggs of *Calanus finmarchicus*. *Journal of the Marine Biological Association of the United Kingdom*, Vol. 35, No. 3, 1956, p. 549–54. [Determined by Linderstrøm-Lang density gradient technique.]

Bousfield, E. L. The cirripede Crustacea of the Hudson Strait region, Canadian eastern arctic. *Journal of the Fisheries Research Board of Canada*, Vol. 12, No. 5, 1955, p. 762–67. [Station list of barnacle species taken by *Calanus* expeditions, 1947–52.]

Boden, Brian P., *and others*. The Euphausiacea (Crustacea) of the North Pacific, by B. P. Boden, Martin W. Johnson and Edward Brinton. *Bulletin of the Scripps Institution of Oceanography of the University of California* (La Jolla, California), Vol. 6, No. 8, 1955, p. 287–400, illus. [Taxonomy and terminology.]

Ray, Carleton. The Alaskan snow flea. *Natural History*, Vol. 65, No. 3, 1956, p. 128–29, 166, illus. [Observation of snow fleas (Collembola: *Isotoma*) on Lemon Creek Glacier and discussion of their life cycle.]

Emerson, K. C. A new Mallophaga from a loon. *Annals and Magazine of Natural History*, Twelfth Series, Vol. 8, 1955, p. 718–20. [Reduces the number of species to two: *Craspedonirmus colymbinus* from *Gavia arctica* and *G. stellata*, and *C. immer* from *G. immer*.]

Alexander, Charles P. *The crane flies of Alaska and the Canadian northwest (Tipulidae, Diptera), The genus Erioptera Meigen.* Ann Arbor, University of Michigan, Museum of Zoology, 1955. 41 p. illus. 25½ cm. (Miscellaneous Publications 90.) [Systematic account.]

Walters, Vladimir. Fishes of western arctic America and eastern arctic Siberia; taxonomy and zoogeography. *Bulletin of the American Museum of Natural History*, Vol. 106, 1955, p. 255–368, illus., maps. [Systematics and distribution.]

Cohen, Daniel M. Age and growth studies on two species of whitefishes from Point Barrow, Alaska. *Stanford Ichthyological Bulletin*, Vol. 4, No. 3, p. 168–87, illus. [*Coregonus nasus kennicotti* Milner and *Coregonus sardinella* (Valenciennes), summer 1952.]

Wohlschlag, Donald E. Growth peculiarities of the cisco, *Coregonus sardinella* (Valenciennes), in the vicinity of Point Barrow, Alaska. *Stanford Ichthyological Bulletin*, Vol. 4, No. 3, 1954, p. 189–209, illus. [Specimens from marine coastal estuary and freshwater lake compared.]

Sdobnikov, V. M. Izmeneniya v ornitofaune severnogo Taymyra [Changes in the bird population of northern Taymyr]. *Priroda* [*Nature*] (Moscow), 1956, No. 9, p. 109–10, illus. [Author's observations in 1949 compared with Birulya and Val'ter's in 1901.]

Taylor, Robert Julian Faussitt. Notes on the birds of Finnmark. *Sterna*, No. 10, 1953, 36 p. illus. [North Norway. Based on observations July–September 1950.]

Belopol'skiy, L. O. Sroki nachala yaytsekladki u morskikh ptits i opredelyayushchiye ikh faktory [Egg dates among sea birds and factors determining them]. *Zoologicheskiy Zhurnal* [*Zoological Journal*], Tom 35, Vypusk 10, 1956, p. 1522–34, maps. [Effect of Gulf-stream on egg-laying dates of 5 species in northern Barents Sea area. English summary.]

Irving, Laurence, *and* Krog, John. Temperature during the development of birds in arctic nests. *Physiological Zoölogy* (Chicago), Vol. 29, No. 3, 1956, p. 195–205, illus. [Effect of low temperatures on nestlings.]

Holgersen, Holger, *and* Willgohs, Johan F. First breeding of the Black-tailed Godwit, *Limosa limosa* (L.), in Norway. *Astarte*, No. 13, 1956, 8 p. illus., map. [Observed in July 1955, at Andenes, Andøya, north Norway; previous records of species in Norway.]

SUTTON, GEORGE MIKSCH, *and* PARMELEE, DAVID F. On the loons of Baffin Island. *Auk*, Vol. 73, 1956, p. 78–84, illus. [Account of *Gavia immer*, *G. arctica* and *G. stellata* observed summer 1953.]

HARRISON, JEFFERY G., *and* WAYRE, PHILIP. A case of congenital muscular hemiatrophy in a Barrow's Goldeneye. *Bulletin of the British Ornithologists' Club*, Vol. 76, No. 8, 1956, p. 129–30. [*Bucephala islandica* hatched from eggs from Iceland.]

WRIGHT, BRUCE S. *High tide and an east wind: the story of the Black Duck.* Harrisburg, Pa., Stackpole; Washington, D.C., Wildlife Management Institute, 1954. xiv, 162 p. illus., maps. 23½ cm. [Study of *Anas rubripes* in eastern North America.]

TAYLOR, ROBERT JULIAN FAUSSITT. A possible moult-migration of Pink-footed geese. *Ibis*, Vol. 95, 1953, p. 638–42, map. [Habits of *Anser arvensis brachyrhynchus* observed in Iceland, June–August, 1952.]

STONEHOUSE, BERNARD. The Brown Skua, *Catharacta skua lönnbergi* (Mathews) of South Georgia. *Falkland Islands Dependencies Survey Scientific Reports*, No. 14, 1956, 25 p. illus., maps. [Study in 1953 and 1954 breeding seasons.]

MACPHERSON, ANDREW. Field work on arctic gulls at Cape Dorset, Baffin Island. *Arctic Circular*, Vol. 8, No. 4, 1955, p. 74–78. [By author, 1955. *Larus hyperboreus* Gunn; *Larus kumlieni* Brewster; *Larus argentatus smithsonianus* Coues.]

GUÐMUNDSSON, FINNUR. Íslenzkir fuglar XI. Hvítmáfur (*Larus hyperboreus*). *Náttúrufræðingurinn*, 25. Árg., 1 Hefti, 1955, p. 24–35, illus., map. [Status of Glaucous Gull in Iceland. English summary.]

AUSTIN, OLIVER L. Notes on banding birds in Antarctica, and on the Adélie Penguin colonies of the Ross Sea sector. *Bird Banding*, Vol. 28, No. 1, 1957, p. 1–26, map. [History of bird ringing in Antarctic; author's work and observations during Operation "Deep Freeze I" 1955–56.]

RICHDALE, L. E. *A population study of penguins.* Oxford, Clarendon Press, 1957. 195 p. illus. 24 cm. 42*s*. [Detailed study of Yellow-eyed Penguin (*Megadyptes antipodes*), based on 18 seasons' observations on Otago Peninsula, New Zealand.]

RIVOLIER, JEAN. *Emperor penguins. Translated from the French by Peter Wiles.* London, Elek Books, [©1956.] 131 p. illus. 22 cm. 15*s*. [Expedition narrative; includes study of *Aptenodytes forsteri* made by author with Expéditions Polaires Françaises in Terre Adélie, 1951–52.]

SLADEN, WILLIAM J. L. Social structure among the penguins. *In: Group processes. Transactions of the second conference, October 9–12, 1955, Princeton, N.J.* New York, Josiah Macy Jr. Foundation, 1956, p. 28–93, illus., map. $3.50. [Habits of *Spheniscidae*.]

WIGGINS, IRA. L. The Gray-cheeked Thrush at Point Barrow, Alaska. *Condor*, Vol. 56, No. 3, 1954, p. 163. [Reports of *Hylocichla minima minima*.]

HARPER, FRANCIS. *The mammals of Keewatin.* Lawrence, University of Kansas, Museum of National History, 1956. 94 p. plates, illus., map. 23 cm. $75. (Miscellaneous Publication No. 12.) [Annotated list of species observed during Nueltin Lake Expedition, 1947.]

LE BLANC, J. S. Rearing of lemmings at Fort Churchill, Manitoba. *Journal of Mammalogy*, Vol. 37, No. 3, 1956, p. 447–48. [Progress of *Dicrostonyx* colony, 1953–55, started in 1950 by Canadian Defence Research Northern Laboratory.]

STEVENS, W. E. The northwestern muskrat of the Mackenzie delta, Northwest Territories, 1947–48. *Wildlife Management Bulletin* (Ottawa, Canadian Wildlife Service), Series 1, No. 8, 1953, 40 p. plates, map. [*Ondatra zibethica spatulata*. Results of author's and Ian McT. Cowan's preliminary investigations.]

SCHILLER, EVERETT L. Ecology and health of *Rattus* at Nome, Alaska. *Journal of Mammalogy*, Vol. 37, No. 2, 1956, p. 181–88, illus. [Effect of winter conditions on rat population.]

[WHALES: NORTH ATLANTIC] Undersøkelser av minkehval og grindhval på Newfoundland. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 11, 1955, p. 637–38. [Studies of Minke Whales (*Balaena acutirostrata*) and Pilot Whales (*Globicephala melaena*) by Newfoundland Fisheries Research Station, 1954. In Norwegian and English.]

MACKINTOSH, NEIL ALISON. Nylig gjennfunne hvalmerker. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 12, 1955, p. 718–19. [Whale marks recovered in Antarctic, 1954–55. In Norwegian and English.]

CHRISTENSEN, GUNNAR. Blåhvalbestanden i det nordlige Atlanterhav. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 11, 1955, p. 640–42. [Confirmation of A. Jonsgård's hypothesis on Blue Whale (*Balaenoptera musculus*) stocks in North Atlantic and adjacent Arctic waters (*Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 9, 1955). In Norwegian and English.]

REES, GWENDOLEN. The scolex of *Tetrabothirius affinis* (Lönnberg), a cestode from *Balaenoptera musculus* L., the Blue Whale. *Parasitology*, Vol. 46, Nos. 3 and 4, 1956, p. 425–42, illus. [Musculature and nervous and excretory systems described.]

GILMORE, RAYMOND M. Rare Right Whale visits California. *Pacific Discovery*, Vol. 9, No. 4, 1956, p. 20–25, illus., map. [Member of *Balaenidae* observed 31 March 1955 off La Jolla.]

CLARKE, ROBERT. Sperm whales of the Azores. *Discovery Reports*, Vol. 28, 1956, p. 237–98, plates, maps. [Biology. Based on whales examined 1949–54; statistics 1896–1954.]

THORLAKSSON, GUDMUNDUR. Af rensdyrets saga i Island. *Grønland*, 1956, Nr. 5, p. 173–78, illus. [History of reindeer (*Rangifer tarandus*) in Iceland since introduction in eighteenth century.]

DEGERBØL, MAGNUS. Det uddøde østgrønlandske rensdyr. *Grønland*, 1957, Nr. 1, p. 11–21, illus. [Extinct reindeer (*Rangifer tarandus eogroenlandicus*, subsp.) of east Greenland.]

BANFIELD, A. W. F. The caribou crisis. *Beaver*, Outfit 286, Spring 1956, p. 3–7, illus., map. [Results and recommendations of Canadian Wildlife Service Surveys, 1949–55.]

BANFIELD, A. W. F. Preliminary investigation of the Barren Ground Caribou. Part 1. Former and present distribution, migrations and status. *Wildlife Management Bulletin* (Ottawa, Canadian Wildlife Service), Series 1, No. 10A, 1954, 79 leaves, maps, illus. [*Rangifer arcticus*. Results of author's field studies, 1948–50, for Canadian Wildlife Service.]

BANFIELD, A. W. F. Preliminary investigation of the Barren Ground Caribou. Part 2. Life history, ecology and utilization. *Wildlife Management Bulletin* (Ottawa, Canadian Wildlife Service), Series 1, No. 10B, 1954, 112 p. illus., map. [*Rangifer arcticus* Results of author's field studies, 1948–50 for Canadian Wildlife Service.]

BANFIELD, A. W. F. A provisional life table for the Barren Ground Caribou. *Canadian Journal of Zoology*, Vol. 33, No. 3, 1955, p. 143–47. [*Rangifer arcticus arcticus* (Richardson). Based on collection of 292 mandibles.]

CRISLER, LOIS. Observations of wolves hunting Caribou. *Journal of Mammalogy*, Vol. 37, No. 3, 1956, p. 337–46. [Attempts of Alaskan wolf (*Canis lupus*) to kill *Rangifer arcticus*. 1953–54. Mostly sick animals killed.]

DARLING, F. FRAZER. Caribou, reindeer and moose in Alaska. *Oryx*, Vol. 2, No. 5, 1954, p. 280–85. [Biological status: summary of 1953 investigations and conclusions.]

FEDOROVA, O. A. Soderzhaniye kal'tsiya i fosfora v krovi i rogakh severnogo olenya [Calcium and phosphorus content in reindeer blood and antlers]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 88–95. [Experimental investigation of relation between growth of antlers and calcium and phosphorus content of blood.]

JENNOV, JOHANNES GERHARDT. Moskusokserne i Grønland. *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 2, p. 9–11. [Musk-ox (*Ovibos moschatus*) in Greenland, and its protection. Attack on C. Vibe's article in *Grønland*, 1954, Nr. 11.]

JENNOV, JOHANNES GERHARDT. Isbjørnen. *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 17, p. 3–6, 20, illus. [Polar bear (*Thalassarctos maritimus*) in Greenland; hunting and protection.]

GIJZEN, AGATHA. Les pinnipèdes. *Zoo* (Anvers), 22e. Année, No. 1, 1956, 35 p. illus. (Reprint.) [General biological account.]

MOHR, ERNA. Das Verhalten der Pinnipedier. *Handbuch der Zoologie* (Berlin), Band 8, 10. Teil (22), 1956, 20 p. illus. [General account of seals of the world.]

DOWNS, THEODORE. A mandible of the seal *Allodesmus kernensis* from the Kern River Miocene of California. *Bulletin. Southern California Academy of Sciences*, Vol. 52, Part 3, 1953, illus. [Detailed description of mandible of earliest known (Tertiary) "eared seal".]

BARTHOLOMEW, GEORGE A., *and* WILKE, FORD. Body temperature in the northern Fur Seal, *Callorhinus ursinus*. *Journal of Mammalogy*, Vol. 37, No. 3, 1956, p. 327–37, illus. [Physiological problem of temperature regulation during terrestrial breeding activities: author's observations, Pribilof Islands, 1951.]

AUBERT DE LA RÜE, EDGAR. L'éléphant de mer des Kerguelen. *Naturalia*, October 1953, p. 22–28, illus. [Author's observations on *Mirounga leonina*, Îles de Kerguelen.]

FISHER, H. D. Utilization of Atlantic Harp Seal populations. *Studies from the Stations of the Fisheries Research Board of Canada*, 1955, No. 416, [12] p. map. (Reprinted from *Transactions of the Twentieth North American Wildlife Conference*, 1955, p. 507–18.) [*Phoca groenlandica*. Research indicates conservation needs.]

LADD, MICHAEL, *and others*. Filtration rate and water diuresis in the seal, *Phoca vitulina*, by Michael Ladd, Lawrence G. Raisz, Charles H. Crowder, jr., and Lot B. Page. *Journal of Cellular and Comparative Physiology*, Vol. 38, 1951, p. 157–64, diagrs. [Results of physiological experiments on 21 captives.]

LAWS, RICHARD MAITLAND. The Elephant Seal (*Mirounga leonina* Linn.). 3. The physiology of reproduction. *Falkland Islands Dependencies Survey Scientific Reports*, No. 15, 1956, 66 p., illus., plates. [Based on specimens from reproductive organs of 88 males and 84 females.]

## MEDICAL SCIENCES

ABS, OTTO. Neues aus der Polarmedizin. 1. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub 1956), p. 273–77. [Review of psychological and medical problems which arise in pola regions.]

WILSON, OVE. Adaptation of the basal metabolic rate of man to climate—a review *Metabolism* (New York), Vol. 5, No. 5, 1956, p. 531–42. [Evidence relating to change in basal metabolic rate in hot and cold climates.]

WILSON, OVE. Basal metabolic rate in the Antarctic. *Metabolism* (New York), Vol. 5 No. 5, 1956, p. 543–54. [Basal metabolic rate of fifteen men measured monthly during two six-month periods. Respiration frequencies for eight men plotted.]

RIVOLIER, JEAN. Froid et altitude dans leurs rapports avec l'alimentation. *Annales de la Nutrition et de l'Alimentation*, Vol. 9, No. 3, 1955, p. 135–77. [Effects of cold and high altitudes on nutrition.]

STEFANSSON, VILHJALMUR. *The fat of the land. Enlarged edition of "Not by Bread Alone" with comment by Frederick J. Stare, M.D., and Paul Dudley White, M.D.* New York Macmillan, 1956. xlii, 339 p. 21½ cm. $5.00. [Sufficiency of meat diet to maintain good health; history and virtues of pemmican.]

GOLUB, I. I. Khvoya yeli—vitaminnaya podkormka dlya zhivotnykh i ptits [Pine needles are a vitamin food for animals and birds]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya . . . [Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture . . .]*, No. 1, 1956, p. 26–27. [Vitamin C content established; successfully used to augment fodder in Komi A.S.S.R.]

EDHOLM, O. G. Physiology in the polar regions. *Nature*, Vol. 178, No. 4540, 1956, p. 954–56. [Report on recent research into physiological adaptation to cold discussed by British Association, Section 1 (Physiology), Sheffield, 4 September, 1956.]

SALT, R. W. Extent of ice formation in frozen tissues, and a new method for its measurement. *Canadian Journal of Zoology*, Vol. 33, No. 6, 1955, p. 391–403, diagrs. [Experiments with insects. Method based on terminal melting points determined after various degrees of drying.]

SAPIN, JALOUSTRE, JEAN. *Enquête sur les gelures. À propos des observations de la 1re Expédition antarctique française en Terre Adélie 1948–1951.* Paris, Hermann, 1956. 190 p. illus., 25 cm. (*Actualités scientifiques et industrielles* 1248. *Expéditions Polaires Françaises, Missions Paul-Emile Victor*, 10.) [General study of problems of cold injury based on clinical observations and on recent literature. English and German summaries, p. 161–63, Bibliography.]

SAPIN-JALOUSTRE, JEAN, *and* SAPIN-JALOUSTRE, H. *Pathologie antarctique. Première expédition en Terre Adélie, 1948–1951.* Paris, Masson, 1956. 16 p. illus., map. 34½ cm. *Expéditions Polaires Françaises. Missions Paul-Emile Victor.* (Reprinted from *La Presse Médicale*, Nos. 24–38, 1956.) [Analysis of pathological observations made during French Antarctic expedition.]

WILLIAMS, RALPH B. A study of the types of tubercle bacilli found in human tuberculosis in Alaska. *Arctic*, Vol. 8, No. 4, 1955, p. 215–23. [Results. Alaska Department of Health.]

LEWIS, ROBERT B. The nature of cold-induced tissue injury. *In: Collected papers on aviation medicine.* London, Published for Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, by Butterworths Scientific Publications, 1955, Chapter 12, p. 112–16, plates. (AGARDograph No. 6.) [Study of tissue changes in legs of rabbits submitted to low temperatures.]

## ENGINEERING AND TECHNOLOGY. TRANSPORT ENGINEERING

MURETOV, N. S. Organizatsiya izucheniya yavleniy obledeneniya provodov [Organization for study of phenomena connected with the icing of electrical conductors]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1957, No. 2, p. 49–52, illus. [Present investigations of factors controlling icing of overhead cables.]

POLEZHAYEV, A. Tret'ya i chetvertaya metallurgicheskiye bazy SSSR [Third and fourth metallurgical bases of the U.S.S.R.]. *Vestnik Instituta po Izucheniyu SSSR* [*Messenger of the Institute for the Study of the U.S.S.R.*], No. 4 (21), 1956, p. 34–44, maps. [Includes assessment of proposed new iron and coal mining centre in southern Yakutskaya A.S.S.R.]

FLINN, MICHAEL. Scandinavian iron ore mining and the British steel industry. *Scandinavian Economic History Review*, Vol. 2, No. 1, 1954, p. 31–46. [British investment in north Scandinavian mining.]

LIVINGSTON, C. W. Excavations in frozen ground. Part 1. Explosion tests in Keweenaw silt. *S[now] I[ce and] P[ermafrost] R[esearch] E[stablishment]. Report* 30, 1956, viii, 117 p. illus. [Tests with various explosives to obtain data on their behaviour in frozen ground.]

BRASTED, ROBERT C. *Migration of moisture in the thermal regime.* University of Minnesota, Institute of Technology, 1954. vii, 119 p. 27½ cm. (Snow, Ice and Permafrost Research Establishment, Corps of Engineers, U.S. Army, Report 14.) [Review of literature relating to study of moisture in soils and building materials at low temperatures. Bibliography.]

HARDY, J. K., *and* BROWN, C. D. *Kinetic temperature of propeller blades in conditions of icing.* London, Her Majesty's Stationery Office, 1954. 12 p. illus. 30½ cm. 3*s.* 6*d.* (Ministry of Supply. Aeronautical Research Council, Reports and Memoranda, No. 2806.) [Calculations for blades with high thermal conductivity and for non-conducting blades.]

HARDY, J. K. *Kinetic temperature of wet surfaces: a method of calculating the amount of alcohol required to prevent ice, and the derivation of the psychometric equation.* London, Her Majesty's Stationery Office, 1953. 13 p. 30½ cm. 4*s.* 0*d.* (Ministry of Supply. Aeronautical Research Council, Reports and Memoranda, No. 2830.) [Protection by alcohol of aircraft propellers and induction system against ice.]

PELLISARI, L. Contro le formazioni di ghiaccio sugli aerei. *Rivista di Meteorologia Aeronautica,* Anno 15, N. 2, 1955, p. 68–69. [Short note on new American method of preventing icing of aircraft by spraying the surface of the machine with lithium chloride.]

SMITH-JOHANNSEN, ROBERT. *United States Patent Office, 2,575,141: surfaces having low adhesion to ice...* [Washington, D.C., U.S. Patent Office, 1951.] [7] p. (Application October 26, 1948, Serial No. 56,673.) [Chemical process for decreasing adhesion of ice to various surfaces.]

STRAUCH, KARL THEODOR. Entstehung, Verhüting und Beseitigung von Eis in stehenden und fliessenden Gewässern und insbesondere an Stauanlagen. *Deutsches Gewässerkundliches Jahrbuch, Besondere Mitteilungen* (Koblenz), No. 10, 1954, 158 p. illus. [Origin, prevention and removal of ice in standing and running waters and especially in dams. Bibliography.]

PERSSON, BENGT. O. E. *Durability and bearing capacity of an ice layer, translated by William Dias.* Boston, Mass., Arctic Construction and Frost Effects Laboratory, Corps of Engineers, U.S. Army, New England Division, 1954. 19 leaves, illus., map. 26½ cm. (Investigation of construction and maintenance of airdromes on ice 1953–54.) [Theory based on observation of Swedish lakes. Originally published in *Svenska Vägföreningens,* Vol. 35, 1948.]

POPOV, S. P. O prokhodimosti i gruzopod"yemnosti ledyanykh pereprav [Practicability and bearing strength of ice crossings]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 11–12. [Method for reindeer herders to work out bearing strength of river and lake ice.]

RIKHTER, G. D., *ed. Voprosy ispol'zovaniya snega i bor'ba so snezhnymi zanosami i lavinami* [*Questions of using snow and combating snow drifts and avalanches*]. Moscow, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1956. 184 p. illus. 26 cm. [Collected papers on agricultural uses of snow, and snow-drift and avalanche control.]

CRAWFORD, CARL B., *and* BOYD, DONALD W. Climate in relation to frost action. *In: Factors related to frost action in soils.* Washington, D.C., Highway Research Board, 1955, p. 63–75, illus., map. (Bulletin 111.) [Problems of frost action in relation to highway maintenance; need for analysis of climatic factors associated with damage.]

DUNCAN, ROBERT DUNDAS, *and others.* A full-scale experiment in bog blasting for road construction, by Robert Dundas Duncan, John Smyth Kenneth Dalzell and Frederick Harry Paston Williams. *Institution of Civil Engineers (London), Road Engineering Division, Session 1950–51, Road Paper,* No. 32, 1951, 41 p. illus. (Reprint.) [Use of explosives to move soils during construction of roads on peat.]

HAAS, WILBUR M. Drainage index in correlation of agricultural soils with frost action and pavement performance. *In: Factors related to frost action in soils.* Washington, D.C., Highway Research Board, 1955, p. 85–98, illus. (Bulletin 111.) [Susceptibility of various soils to frost action and their suitability for road foundations.]

MOTL, C. L. Report of committee on load carrying capacity of roads as affected by frost action. *Proceedings of the Highway Research Board,* Vol. 28, 1948, p. 273–81, illus. [U.S.A. Results of field tests by research committee from nine States.]

MOTL, C. L. Report of committee on load-carrying capacity of roads as affected by frost action. *Proceedings of the thirty-fourth annual meeting of the Highway Research Board,* January 1955, p. 439–52, tables, diagrs. [Reports by Indiana and Oregon States on field experiments, 1953–54.]

SAYMAN, WILLIAM C. Plate-bearing study of loss of pavement supporting capacity due to frost. *In: Factors related to frost action in soils.* Washington, D.C., Highway Research Board, 1955, p. 99–106, illus. (Bulletin 111.) [Summary of field studies.]

WOLFF, A. *Winter roads on ice, translated by William C. Dias.* Boston, Mass., Arctic Construction and Frost Effects Laboratory, Corps of Engineers, U.S. Army, New England Division, 1954. 14 leaves, illus. 26½ cm. (Investigation of construction and maintenance of airdromes on ice, 1953–54.) [Maintenance of roads across frozen rivers in Sweden. Originally published in *Svenska Vägföreningens Tidskrift*, Årg. 27, 1940.]

[SHIPS: *FORT HEARNE*] Sailing on top of the world. *Imperial Oil Review*, Vol. 38, No. 1, 1954, p. 26–30, illus. [Hudson's Bay Company's freighter *Fort Hearne* supplying isolated ports in western Arctic.]

[SHIPS: *ODEN*] Icebreaker with 12,000-b.h.p. machinery. Launch of the "Oden" for service in Swedish waters. *Motor Ship*, December 1956, p. 362–63. [Brief description of vessel.]

BORGGREN, LUDVIG. Från "Vandal" till "Ymer". *Dædalus*, (Stockholm), 1954, p. 117–30, illus. [Important part played by Sweden in developing use of diesel power in vessels, including icebreakers.]

JANSSON, JAN-ERIK. Ice-breakers and their design. *European Shipbuilding*, Vol. 5, No. 5/6, 1956, p. 3–27, illus. [Principles of icebreaker construction and their application in recently built ships.]

LÖFSTRÖM, PELLE. Isbrytare. *Svenska Turistföreningens Årsskrift*, 1955, p. 224–37, illus., map. [Sweden's icebreakers; their work; daily life on board.]

[ICEBREAKERS] USSR ice-breaker with atomic plant. *United States Naval Institute Proceedings*, Vol. 82, No. 9, 1956, p. 1016–18, illus. [Translation from *Pravda*, 12 February 1956, with sketch.]

MOLLESTAD, SVERRE. Fiskeflåten 1954. *Årsberetning vedkommende Norges Fiskerier*, 1954, Nr. 13 (pub. 1955), 35 p. illus. [Statistical data on boats of Norwegian fishing fleet in 1954.]

## AGRICULTURE. FORESTRY. HORTICULTURE

[ILES DE KERGUELEN: AGRICULTURE] Une réussite inattendue. Élevage et horticulture aux Îles Kerguelen. *Chroniques d'Outre Mer* (Paris), No. 30, Novembre–Décembre 1956, p. 3–6, illus. [Introduction of sheep, cattle, Shetland ponies, pigs and poultry; destruction of rabbits with myxomatosis to improve pasture; horticulture.]

DADYKIN, V. P. *ed. Materialy o prirodnykh usloviyakh i sel'skom khozyaystve yugo-zapada Yakutskoy ASSR. Vypusk 1* [*Materials on natural conditions and agriculture of southwestern Yakutskaya A.S.S.R. No. 1*]. Moscow, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1956. 256 p. illus., maps. 27 cm. (Trudy Yakutskogo Filiala, Vypusk 1.) [Collected papers on arable and livestock farming and natural factors controlling these; based on field investigations, 1952–54.]

SAVKINA, Z. P. *Ukazaniya po raschistke lugov ot kustarnikov na kraynem severe* [*Instructions for clearing shrubs from fields in the far north*]. Leningrad, Nauchno-Issledovatel'skiy Institut Polyarnogo Zemledeliya... [Research Institute of Polar Agriculture...], 1955. 12 p. 20 cm. [Recommended extent of cleared area and methods of clearance.]

TSIRK, G. P. Priyemy osvoyeniya tundrovykh zemel' [Methods of pioneer cultivation of tundra soils]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 49–50. [Experiments with varying amounts of fertilizer in Salekhard region, 1954–55.]

BURAKOVA, V. V. Effektivnost' bakterial'nykh udobreniy na Yeniseyskom severe [Effectiveness of bacterial fertilizers in the Yenisey north]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 52–53. [Experiments at Igarka, 1951–53.]

IVANOVSKIY, A. I. Yachmen' v sovkhoze "Gornyak" [Barley at the "Gornyak" state farm]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 45–46. [Results of experiments in Komi A.S.S.R., 1941–55.]

RITCHIE, J. C. The vegetation of northern Manitoba. 1. Studies in the southern spruce forest zone. *Canadian Journal of Botany*, Vol. 34, No. 4, 1956, p. 523–61, illus., maps. [Ecological account.]

TOLSTOV, A. N. Sledy drevnego proizrastaniya derev'yev [Traces of ancient tree growth]. *Priroda* [*Nature*], 1956, No. 10, p. 102–04, illus. [Larch (*Larix dahurica*) remains found north of present tree line on lower Indigirka.]

## DOMESTIC ANIMALS. LIVESTOCK

PREOBRAZHENSKIY, B. V. Kleymeniye oleney putem tatuirovki [Tattooing reindeer as a method of branding]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 10–11, illus. [Method used.]

KRISTIANSEN, ABEL. Fra fangererhverv til fåreavl. *Grønland*, 1955, Nr. 12, p. 464–70, illus. [History of sheep farming in Greenland; the station at Julianehåb.]

DRURI, S. M. Nekotoryye itogi pervykh let akklimatizatsii tundrovykh oleney v lesnoy zone [Some results of the first years of acclimatization of tundra reindeer in the forest zone]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 23–58. [Experiments to determine extent of acclimatization carried out in central Komi A.S.S.R. since 1941.]

POPOV, S. P. Osnovy ekspluatatsionnykh raschetov v olennom transporte [Basis of exploitation calculations in reindeer transport]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 148–69. [Attempt to determine "normal" performance in load pulling and carrying.]

RENSUND, LARS. Av S.S.R. utsedda kommitterade på vandring i de stora viddernas land norr om Torneträsk. *Samefolkets Egen Tidning*, Årg. 37, Nr. 4, 1955, p. 3–7, illus. [Inspection tour of committee, set up by Svenska Samernas Riksförbund, of reindeer pastures in Karesuando parish (north Sweden) and adjoining Norwegian districts; conclusions drawn.]

DRURI, I. V. Kratkiye itogi plemennoy raboty v olenevodstve [Short results of selective breeding in reindeer husbandry]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 3–22. [Based on results in various parts of Soviet Arctic since work was started in 1936.]

BREYEV, K. A. Metody ucheta dinamiki chislennosti kozhnogo ovoda severnogo olenya [Method of calculating population dynamics of reindeer warble]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 174–85, illus. [Author's method explained.]

GOLOSOV, I. M., *ed., and others*. Voprosy veterinarii v olenevodstve [Veterinary questions in reindeer husbandry]. Edited by I. M. Golosov, S. P. Popov and D. V. Savel'yev. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 3, 1956, 149 p. illus. [Collected papers on lung and hoof diseases, warble control, blood groups and skin conditions.]

SAVEL'YEV, D. V. *Kozhnyy ovod—bich olenevodstva* [*The warble—the scourge of reindeer farming*]. Moscow, Izdatel'stvo Ministerstva Sel'skogo Khozyaystva SSSR [Publishing House of the Ministry of Agriculture of the U.S.S.R.], 1955. 1 sheet, illus. [Method of applying new anti-warble spray.]

FEDOROVA, O. A. Znacheniya sena v ratsionakh severnogo olenya [Importance of hay in reindeer rations]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 73–87. [Experiments to determine physiological effect of varying quantities of hay in diet.]

KAREB, G. I. Opyt vvedeniya pastbishcheoborotov v olenevodcheskikh kolkhozakh Nenetskogo Natsional'nogo okruga [Experimental introduction of pasture rotation in reindeer collective farms of Nenetskiy Natsional'nyy Okrug]. *Byulleten' Nauchno-Tekhnicheskoy Informatsii Nauchno-Issledovatel'skogo Instituta Polyarnogo Zemledeliya...* [*Bulletin of Scientific and Technical Information of the Research Institute of Polar Agriculture...*], No. 1, 1956, p. 8–9. [Results of experimental introduction of 3-year rotation.]

SPIGUL, E. M. Pitatel'noye dostoinstvo briketirovannogo konskogo kombikorma no. 36 dlya severnogo olenya [Nutritional value of combined horse fodder no. 36 in briquettes for reindeer]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 59–72. [Experiments with 6 castrated bulls to determine effect of this fodder by itself and mixed with varying amounts of reindeer moss.]

SPIGUL, E. M. Podkormka istoschchennykh oleney [Feeding up exhausted deer]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa*

[*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 96–99 [Experiments at Murmansk in 1949 to determine effect of special diet on worn out transport reindeer.]

VASIL'YEV, V. N. *Rastitel'nost' Anadyrskogo kraya* [*Vegetation of the Anadyr' region*]. Moscow, Leningrad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1956. 219 p. illus., maps. 23 cm. [Special reference to reindeer pastures.]

## HUNTING. FISHING

[FISHING INDUSTRY: ARCTIC] Fiskeriinspektørenes virksomhet 1/7 1953–31/12 1954. *Årsberetning vedkommende Norges Fiskerier*, 1955, Nr. 11 (pub. 1956), 139 p. [Inspectors' reports on all aspects of Norwegian fisheries, including whaling and sealing, July 1953–December 1954.]

FINLEY, BOB. Relative productivity and value of the fisheries of the United States and Alaska, 1951. *Commercial Fisheries Review*, (Washington, D.C.), Vol. 16, No. 4, 1954, 11 p. illus.

POWER, E. A., *and* PETERSON, C. E. *Fisheries of the United States and Alaska 1954; a preliminary review*. Washington, D.C., United States Fish and Wildlife Service, 1955. 30 p. illus. 26½ cm. (Fishery Leaflet 393.) [Statistics of catch, exports, etc.]

[NORWAY: FISHING INDUSTRY] Fiskeri-undervisningen 1955–1956. *Årsberetning vedkommende Norges Fiskerier*, 1956 (pub. 1956), Nr. 8, 29 p. [Norwegian fishing industry: training and instruction courses, 1955–56.]

[NORWAY: FISHING INDUSTRY] Samvirkekonsulentenes virksomhet i tiden 1. juli 1952 til 31. desember 1953. *Årsberetning vedkommende Norges Fiskerier*, 1953 (pub. 1956), Nr. 12, 94 p. [Advisors' reports for July 1952–December 1953 on activities of Norwegian fishing co-operatives, including those of north Norway.]

[NATIONAL AND INTERNATIONAL REGULATION OF FISHERIES] International Commission for the Northwest Atlantic Fisheries. *FAO Fisheries Bulletin*, Vol. 8, No. 3, 1955, p. 148–50, map. [Fifth meeting, Ottawa, 6–11 June 1955.]

[FISHERIES RESEARCH: ARCTIC OCEAN] *Annales Biologiques* (Conseil Permanent International pour l'Exploration de la Mer, Charlottenlund Slot, Danemark), Vol. No. 11, 1954 (pub. 1956), 186 p. illus., maps. [Reports on fisheries research, 1954, including Arctic Ocean. Text in English.]

[ICELAND: FISHING RESTRICTIONS] *The dispute with Iceland: memorandum submitted to the Council of Europe by the Government of the United Kingdom, May, 1955.* [London, Foreign Office, 1955.] 23 p. diagrs. 28 cm. [Reply to Icelandic Government's memorandum to Council of Europe upholding exclusion of foreign fishing vessels from Icelandic waters by regulations published in March 1952.]

KENNEDY, W. A. The first ten years of commercial fishing on Great Slave Lake. *Fisheries Research Board of Canada Bulletin*, No. 107, 1956, vii, 58 p. illus. [History and catch analyses, 1945–54.]

SCHAEFERS, EDWARD A., *and* FUKUHARA, FRANCIS M. Offshore salmon explorations adjacent to the Aleutian Islands, June–July 1953. *Commercial Fisheries Review* (Washington, D.C.), Vol. 16, No. 5, 1954, 20 p. illus. [Work of United States Fish and Wildlife Service's fishing vessel *John N. Cobb*.]

## WHALING AND SEALING INDUSTRIES

WHITTAM, GEOFFREY. *The whale hunters*. London, Bell, 1954. viii, 182 p. illus. 21 cm. [Stories of whaling, past and present.]

GARDI, RENÉ. *Unter Walfängern und Eismeerfischern*. Zürich, Orell Füssli, [c1954.] 226 p. illus., maps. 23 cm. [Norwegian whaling and fishing industry in northern waters.]

JONSGÅRD, ÅGE. Om utviklingen av den nåværende norske småhvalfangst. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 12, 1955, p. 697–718, illus., maps. [Development of modern Norwegian small whale industry (whales under 12 m. long). In Norwegian and English.]

RONAYNE, MARK. Pothead roundup. *Trade News*, Vol. 9, No. 3, 1956, p. 3–5, illus. [Newfoundland. Organized killing of whales to provide food for mink farms.]

ROBERTSON, R. B. *Of whales and men*. London, Macmillan, 1956. xiv, 247 p. illus., map (on end papers). 22 cm. [General account of whaling in Southern Ocean. Author accompanied expedition as medical officer, 1950–51.]

[Whaling. International Regulation] "Olympic Challenger" har ikke overholdt Den Internasjonale Hvalfangstkonvensjons bestemmelser. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 11, 1955, p. 645–62. [Non-observation by *Olympic Challenger* of international whaling regulations, 1950–55. Text of Norwegian report to contracting governments. In Norwegian and English.]

[Sealing Industry: Arctic] Beretning om selfangsten, håkjerringfisket og overvintringsekspedisjonene i 1955. *Årsberetning vedkommende Norges Fiskerier*, 1955, Nr. 10 (pub. 1956), 23 p. [Norwegian arctic sealing, hunting and Greenland shark fishing, 1955.]

[Guano Islands] Government Guano Islands division. Guano production and distribution. *Commerce and Industry* (Pretoria), Vol. 15, No. 6, 1957, p. 299–305, 312, illus. [Report, September 1955 to August 1956; includes sealing and collection of penguin eggs.]

[Sealing. International Regulation] *Fur seals: research programs in the North Pacific Ocean. Agreement between the United States of America, Canada, and Japan.* Washington, D.C., U.S. Government Printing Office, 1953. 9 p. 23½ cm. (Department of State Publication 4758.) [Agreement on programme to be carried out February–June, 1952.]

## TRANSPORT AND POSTAL SERVICES

[Alaska: Transport] *Alaska passenger traffic survey, 1955.* Juneau, Alaska Resource Development Board, 1956. 13 leaves. illus. 28 cm.

Popov, S. P. Osobennosti obrazovaniya i fizikomekhanicheskiye svoystva snezhnogo pokrova kak puti dlya peredvizheniya nartovogo transporta [Features of the formation and physical and mechanical properties of snow cover as a medium for the movement of sledge transport]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 100–33, illus. [Zoning of U.S.S.R. by snow surfaces, their effect on sledging, practical hints on preparing sledges.]

Vostryakov, P. N. Podgotovka i trenirovka yezdovykh oleney [Preparation and training of draught deer]. *Trudy Nauchno-Issledovatel'skogo Instituta Sel'skogo Khozyaystva Kraynego Severa* [*Transactions of the Research Institute of Agriculture of the Far North*], Tom 2, 1956, p. 134–47. [Hints on training reindeer for pulling sledges, based on experiments in 1947 and 1949].

Pedersen, Einar S. Handelsluftfahrt in der Arktis. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 301–33. [Problems confronting transarctic commercial airline service.]

Godsell, Philip Henry. *Pilots of the purple twilight; the story of Canada's early bush flyers.* Toronto, Ryerson Press, 1955. xiv, 225 p. illus., map (on end papers). 20½ cm. [History of civil aviation, 1920–30.]

Benson, Carl S. Resupply of ice-cap expeditions by air drop. *S*[*now*] *I*[*ce and*] *P*[*ermafrost*] *R*[*esearch*] *E*[*stablishment*]. *Special Report* No. 17, 1955, 4 leaves. illus. [Describes system used on S.I.P.R.E. Ice Cap Expedition "Jello", 1955, in Greenland.]

Neudeck, Joseph E. *United States Patent Office 2,579,692: gasoline fuel containing dimethyl carbinol and solvent oil...* [Washington, D.C., U.S. Patent Office, 1951.] [5] p. (Application December 9, 1949, Serial No. 132,211.) [Method of treating petrol to prevent freezing in carburettors.]

## BUILDING CONSTRUCTION

Himmelstrup, Olav. Boligbyggeriet i Grønland. *Grønland*, 1956, Nr. 4, p. 150–59, illus. [House building in Greenland; its special problems.]

Bergström, Sven G. *Frysförsök med cementbruk.* Stockholm, Svenska Forskningsinstitutet för Cement och Betong vid Kungl. Tekniska Högskolan i Stockholm, 1955. 23 p. illus. 25 cm. 2 *Sw.Kr.* (Meddelanden Nr. 32.) [Tests on various factors affecting frost resistance of cement mortar. English summary.]

Rogers, Tyler Stewart, *and others. Design of insulated buildings for various climates. By Tyler Stewart Rogers, assisted by Paul A. Siple, Elmer Queer, Howard T. Fisher, John Hancock Callender.* New York, F. W. Dodge Corporation, [c1951]. 119 p. illus. 31 cm. $5.50. [Popular account of theory and practice.]

[Thermal Insulation of Buildings] *The thermal insulation of buildings; design data and how to use them.* London, Her Majesty's Stationery Office, 1956. viii, 139 p. illus. 24½ cm. 12*s.* 6*d.* (Department of Scientific and Industrial Research. Building Research Station.) [Use, performance and cost of heat-insulating materials.]

## THE ARTS. ARCHITECTURE. ENTERTAINMENT. RECREATION

CHIPMAN, PAUL. The living stone. *Beaver*, Outfit 286, Spring 1956, p. 12–19, illus. [Photographs of Eskimo sculpture.]

[PHOTOGRAPHY] *Notes for the photo traveler abroad.* Rochester, N.Y., Eastman Kodak Company, [1955]. 8 p. 11½ cm. (Kodak Pamphlet No. C-17.) [Practical advice about films, facilities etc.]

ANDREYEV, V. N. Deshifrirovaniye po aerofotosnimkam razlichnykh tipov tundra i ikh aerovizual'naya kharakteristika po moroznoy treshchinovatosti [Interpreting from air photography different types of tundra, and their frost-crack characteristics when seen from the air]. *Geograficheskiy Sbornik* [*Collected Papers on Geography*], Tom 7, 1955, p. 103–20, illus. [Hints on interpretation, with special reference to frost polygons and vegetation.]

BAMPING, FRANK. Films on polar exploration and research. *Scientific Film Review*, Vol. 3, No. 2, 1957, p. 53–68. [Preliminary list of films available to borrowers in Great Britain.]

BORENIUS, GUSTAF. Intrycksböckerna i Kebnekaise. *Till Fjälls*, Årg. 28, 1956, p. 34–41, illus. [Climbers' comments, 1908 to present day, preserved at Kebnekaise tourist station, north Sweden.]

BORENIUS, GUSTAF. Våra bestigningar 1956. *Till Fjälls*, Årg. 28, 1956, p. 62–64. [Ascents by Swedish mountaineers in 1956, including north Sweden.]

OLSSON, OLOV. Påsk i Äpar 1956. *Till Fjalls*, Årg. 28, 1956, p. 59–61, illus., map. [First ascent of Triangeltoppen, Sarek area, north Sweden, March 1956.]

[FILM PRODUCTION] "Continente blanco"; la Antártida Argentina será escenario de este film. *Argentina Austral*, Año 27, No. 291, 1955, p. 31, illus. [Proposed Argentine film with principal scenes set in Deception Island and Melchior Islands and on board icebreaker *General San Martín*.]

## EXPEDITIONS. HISTORY OF EXPLORATION

### *Arctic*

CIRONE, MASSIMO. Ricorrendo il trentesimo anniversario del volo transpolare Amundsen–Ellsworth–Nobile: appunti di un medico. *Giornale di Medicina Militare*, Anno 106, Fasc. 4, 1956, p. 545–58. [Narrative of *Norge*'s trans-arctic flight of 1926 from medical and psychological angle.]

GEORGI, JOHANNES. *Im Eis vergraben: Erlebnisse auf Station "Eismitte" der letzten Grönland-Expedition Alfred Wegeners. 2nd edition.* Leipzig, Brockhaus, 1955. 355 p. illus., map. 21 cm. [Experiences of Wegener Greenland expedition, 1930–31.]

LEONT'YEV, F. S. *V prostorakh zapolyar'ya* (*zapiski naturalista*) [*In polar expanses* (*a naturalist's notes*)]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1956. 184 p. illus., 20 cm. [Botanical journey in Kolyma basin in 1937.]

FARRAR, F. S. *Arctic assignment; the story of the St Roch, edited by Barrett Bonnezen.* London, Macmillan, 1955. x, 180 p. illus., map (on end papers). 22 cm. 11*s.* 6*d.* [Author was member of crew of Royal Canadian Mounted Police schooner *St Roch* on cruise through Northwest Passage, 1940–42.]

MALAURIE, JEAN. The French geographical expedition to Thule, 1950–51: a preliminary report. *Arctic*, Vol. 8, No. 4, 1955, p. 202–14, illus., map. [Demography; human geography; geomorphology.]

GLEDITSCH, KRISTIAN. An expedition to Norway. *Geographical Journal*, Vol. 119, Part 3, 1953, p. 370. [Adverse comment by Director of Norges Geografiske Oppmåling on geographical "discoveries" and mapping efforts of 1952 British expedition to Lyngen Peninsula, leader Showell Styles, *ibid.* Part 1, p. 117–18.]

ORVIN, ANDERS K. Expeditionen des Norsk Polarinstitutt nach Svalbard, Jan Mayen und Ostgrönland in den Jahren 1953 und 1954. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 299–300. [Outline of Norsk Polarinstitutt's expeditions to Svalbard, Jan Mayen and east Greenland, 1953 and 1954.]

MANNING, THOMAS H. Narrative of a second Defence Research Board expedition to Banks Island, with notes on the country and its history. *Arctic*, Vol. 9, Nos. 1–2, 1956, p. 2–77, illus., map. [1953; led by author. Includes list of place-names approved by Canadian Board on Geographical Names.]

MELLOR, R. E. H. A note on Soviet arctic research. *Geographical Studies*, Vol. 3, No. 1, 1956, p. 64–67, map. [Mainly account of work of Soviet drifting stations SP-2, SP-3 and SP-4. Based on article in *Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya*, 1954.]

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[Expeditions: Arctic] Eastern Arctic Patrol. *Arctic Circular*, Vol. 8, No. 4, 1955, p. 79–81. [Thirty-fourth patrol carried out by *C. D. Howe* and *d'Iberville*. Eskimo families removed to Resolute and Craig Harbour.]

Knuth, Eigil. Danish archaeological expedition to Danmarks Fjord, northeast Greenland, summer 1955. *Arctic Circular*, Vol. 8, No. 4, 1955, p. 72–74. [Narrative.]

Mellor, Malcolm. University Spitzbergen expedition 1955. *Survey*, (Nottingham University), Vol. 6, No. 1, 1955, p. 25–29, illus., map. [Leader's narrative of Nottingham University Expedition.]

*Antarctic*

Ossoinak de Sarrailh, Efi Emilia, *and others*. Nuevos aportes argentinos a la historia del conocimento de la Antártida durante el siglo XIX, by Efi Emilia Ossoinak de Sarrailh, Maria Luisa Cannelle de Ambrosini, Maria Susana Donaldson. *Universidad Nacional de Cuyo. Actas de la XV semana de geografía* (San Juan, Mendoza, San Luis, Argentina), 1951, p. 214–25, map. [Review of whaling and sealing voyages from Buenos Aires to antarctic waters in late 18th and early 19th centuries.]

John, D. Dilwyn. The Falkland Islands and their Dependencies. *Geographical Journal*, Vol. 122, Part 2, 1956, p. 279–80. [Work of Discovery Investigations, 1925– .]

Dewing, Charles E., *and* Kelsay, Laura E., *compilers*. *Records of the United States Antarctic Service*. Washington, D.C., National Archives. 1955. v, 59 p. 27 cm. (Preliminary Inventories No. 90.) [Preliminary inventory of records relating to expedition, 1939–41.]

[Falkland Islands Dependencies] The Dependencies. *In: Colonial reports. Falkland Islands 1954 and 1955*. London, 1956, p. 49–70, illus. (between p. 36–37), map (folding at end). [Review of British activities in Falkland Islands Dependencies, 1954–55.]

[Expeditions: Antarctic] *Antártida Argentina*. Buenos Aires, Subsecretaría de Informaciones, [1952]. [32] p. illus. 26½ cm. [Pictorial account of Argentine expedition to Antarctica led by Hernan Pujato, 1950–51.]

Pujato, Hernán, *and* Perón, Juan Domingo. *Expedición científica a la Antártida; sus actividades y resultados. Conferencia del General Hernan Pujato, discurso del General Juan Perón*. Buenos Aires, Subsecretaría de Informaciones, 1952. 52 p. 24 cm. [General account of Argentine expedition to Antarctica led by Hernán Pujato, 1950–51.]

Migot, André. *The lonely south. Translated from the French by Richard Graves*. London, Hart-Davis, 1956. 206 p. illus., maps. 22½ cm. 21*s*. [Narrative of author's year as medical officer on Îles de Kerguelen, 1953, and of his voyage to Mac-Robertson Land with A.N.A.R.E. party, January–March 1954.]

Sutton, George. *Glacier island: the official account of the British South Georgia Expedition, 1954–55*. London, Chatto and Windus, 1957. 224 p. illus., maps. 22 cm. 21*s*. [Mountaineering expedition led by George Sutton.]

[Expeditions: Antarctic] The Royal Society Antarctic expedition. *Notes and Records of the Royal Society of London*, Vol. 12, No. 1, 1956, p. 137–38, illus. [Outline of programme.]

Heaney, John B., *and* Holdgate, Martin W. The Gough Island Scientific Survey. *Geographical Journal*, Vol. 123, Part 1, 1957, p. 20–32, illus., map. [Account of expedition, 1955–56.]

Foster, Michael J. N. Operation Deepfreeze 1. *Geographical Journal*, Vol. 123, Part 1, 1957, p. 1–12, illus., maps. [Narrative of U.S. antarctic expedition, 1955–56, by British observer.]

Oglesby, Joseph E. *Operation Deepfreeze, 1955–56: the chronicle of Task Force 43 and its service to science in the first phase of a project of four years' duration*. Paoli, Pa., Dorville Corporation, [c1956]. 200 p. illus., maps. 28½ cm. [Narrative of U.S. antarctic expedition. Mainly photographs.]

[Expeditions: Antarctic] *U.S. Navy Hydrographic Office report on Operation Deepfreeze 1*. Washington, D.C., U.S. Navy Hydrographic Office, 1956. iv, [179] p. illus., maps (3 folding). 26½ cm. $1.50. (H.O. 16331–1.) [Part 1. Plans and recommendations for Deepfreeze 2. Part 2. Report on Deepfreeze 1. Charting, oceanographic surveys, ice reconnaissance in antarctic waters, 1955–56.]

Fuchs, Vivian Ernest. Voyage of Trans-Antarctic Expedition's advance party to the Antarctic. *Marine Observer*, Vol. 27, No. 175, p. 27. [1955: leader's narrative.]

Burkhanov, V. F. Report on the research work in the Antarctic during the season of 1955–1956. *In: Accounts and materials of the Complex Antarctic Expedition of the USSR Academy of Sciences* (Moscow, Academy of Sciences), 1956, p. 1–31. [Narrative, equipment, plans.]

Shcherbakov, D. I. *Dlya chego uchenyye issleduyut antarktiku* [*Why scientists study the Antarctic*]. Moscow, Moskovskiy Rabochiy [Moscow Worker], 1956. 56 p. illus., maps. 20 cm. [Historical and scientific background to current Soviet antarctic expedition.]

Somov, M. M. On the results of the work of the Complex Antarctic Expedition of the U.S.S.R. Academy of Sciences during the season of 1955–1956. *In: Accounts and materials of the Complex Antarctic Expedition of the Academy of Sciences* (Moscow, USSR Academy of Sciences), 1956, p. 32–39. [Leader's preliminary report.]

Scanlan, Hugh. Mapping Graham Land. *Corona*, April 1956, p. 129–32, map. [Air survey by Hunting Aerosurveys Limited for Falkland Islands and Dependencies Administration.]

Mavrodin, V. V. *Russkiye polyarnyye morekhody (s drevneyshikh vremen do xvi veka)* [*Russian polar seafarers (from earliest times to the 16th century)*]. Leningrad, Vsesoyuznoye Obshchestvo po Rasprostraneniyu Politicheskikh i Nauchnykh Znaniy. Leningradskoye Otdeleniye [All-Union Society for Dissemination of Political and Scientific Knowledge. Leningrad Branch], 1955. 32 p. 20 cm.

Zubov, N. N. *Otechestvennyye moreplavateli-issledovateli morey i okeanov* [*Our country's seamen and investigators of the seas and oceans*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1954. 475 p. maps. 26½ cm. [Narrative of main Russian voyages from earliest times; many arctic explorations included.]

Dautert, Erich. *Der Wettlauf zum sechsten Kontinent; zwei Jahrhunderte Abenteuer- und Entdeckerfahrten in die Antarktis.* Oldenburg/Hamburg, Gerhard Stalling, [c1954]. 288 p. illus., map (on end papers). 22½ cm. [History of antarctic exploration.]

Kemp, Norman. *The conquest of the Antarctic.* London, Allan Wingate, 1956. 152 p. illus., map (on end papers). 22 cm. 16*s*. [General historical background to Commonwealth Transantarctic Expedition.]

Khvat, Lev Borisovich. *Zagadochnyy materik* [*Mysterious continent*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1956. 288 p. illus., maps. 20 cm. [Popular history of antarctic exploration.]

## BIOGRAPHY

Rosenkrantz, Alfred. O. B. Bøggild 16. maj 1872–13. november 1956. *Grønland*, 1957, Nr. 1, p. 40, port. [Obituary of Danish mineralogist.]

[Biography] Prof. R. N. Rudmose Brown. *Nature*, Vol. 179, No. 4560, 1957, p. 610–11. [Obituary.]

Priestley, *Sir* Raymond. Captain V. L. A. Campbell, D.S.O., R.N., 1875–1956. *Geographical Journal*, Vol. 123, Part 1, 1957, p. 131–32. [Obituary.]

Brun, Eske. Jørgen Niels Peter Chemnitz, Dm., R., Fm. 13. februar 1890–19. april 1956. *Grønland*, 1956, Nr. 5, p. 200, port. [Obituary of Greenland administrator.]

Gad, Finn. Christopher Carl Dalager 9. april 1726–1. januar 1799. *Grønland*, 1955, Nr. 2, p. 78–79. [Biographical note on Danish colonizer in Greenland.]

Tiedemann, Karl-Heinz. Dr. Max Grotewahl 60 Jahre alt. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1955), p. 316. [Biography.]

MacMillan, Donald B. Matthew Henson. *Explorers Journal*, Vol. 33, No. 1, 1955, p. 28–31, 93, illus., port. [Obituary of R. E. Peary's companion.]

Friis, Herman R. W. L. G. Joerg, 1885–1952. *Annals of the Association of American Geographers*, Vol. 43, No. 4, 1953, p. 255–83. [Obituary.]

Mikkelsen, Ejnar. *Two against the ice, translated from the Danish by Maurice Michael.* London, Rupert Hart-Davis, 1957. 224 p. illus., map. 22 cm. [Second volume of autobiography. *Alabama* expedition to north-east Greenland, 1909–12. Originally published as *Farlig tomandsfaerd.* Copenhagen, 1955.]

Tomkeieff, S. I. V. A. Obruchev. *Nature*, Vol. 178, No. 4541, 1956, p. 1028. [Obituary.]

Oxaas, Arthur. *Svalbard var min verden. Annet opplag.* Oslo, Aschehoug, 1955. 224 p. illus., map. 21½ cm. 24 *N.Kr.* [Autobiography of Norwegian hunter who has wintered 29 times in Svalbard.]

Müller, D. Morten Pedersen Porsild 1. september 1872–30. april 1956. *Grønland*, 1956, Nr. 6, p. 240, port. [Obituary of Danish arctic botanist.]

Oldendow, Knud. Grønlændervennen Hinrich Rink. Videnskabsmand, skribent og grønlandsadministrator. *Det Grønlandske Selskabs Skrifter*, 18, 1955, 94 p. illus. [Biography of Danish Greenland administrator, 1819–93, based on partly new material.]

Grotewahl, Max. Studienrat Kurt Ruthe 60 Jahre. *Polarforschung*, Band 3, Heft 1/2, 1954 (pub. 1956), p. 316. [Biography.]

Armstrong, Terence Edward. Otto Yul'yevich Shmidt. *Geographical Journal*, Vol. 122, Part 4, 1956, p. 534. [Obituary.]

Wild, Roland. *Arctic command; the story of Smellie of the Nascopie.* Toronto, Ryerson Press, 1955. xxiv, 194 p. illus., map. 20½ cm. [Biography.]

Sutton, Ann, *and* Sutton, Myron. The adventures of Steller. *Natural History*, Vol. 65, No. 9, 1956, p. 485–91, illus., map. [Life of Georg Wilhelm Steller, naturalist of Bering's expedition, 1741–42.]

TROELSEN, JOHANNES C. Gustaf T. Troedsson 9/5/1891–12/12/1954. *Meddelelser fra Dansk Geologisk Forening*, Bd. 13, Hefte 1, 1955, p. 53–55, port. [Obituary of Swedish geologist.]

ZUBOV, N. N. *Izbrannyye trudy po okeanologii (k 70-letiyu so dnya rozhdeniya avtora)* [*Selected works on oceanology (on the author's 70th birthday)*]. Moscow, Voyennoye Izdatel'stvo Ministerstva Oborony Soyuza SSR [Military Publishing House of the Ministry of Defence of the U.S.S.R.], 1955. 548 p. illus., maps. 22½ cm. [Includes some papers on floating ice, and full bibliography of author's works. Biographical note by A. D. Dobrovol'skiy.]

## ARCTIC REGIONS IN GENERAL

[POLAR REGIONS: BIBLIOGRAPHY] *The polar bibliography, Vol. 1*, Washington, D.C., Library of Congress, Technical Information Division, 1956. xii, 223 p. 26 cm. (Produced for the U.S. Department of Defense.) [Lists 1000 unpublished items. Author and subject index.]

RODAHL, KAARE. Arctic survival problems. *In: Collected papers on aviation medicine.* London, Published for Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, by Butterworths Scientific Publications, 1955, Chapter 7, p. 41–51. (AGARDograph No. 6.) [Summary of existing knowledge; pointer to future research.]

### *Greenland*

MARTINSSON, ERIK. *Grönländska strandhugg.* Stockholm, Förlaget Filadelfia, 1953. 159 p. illus. 22 cm. 10 *Sw.Kr.* [Contemporary Greenland; emphasizes social and religious conditions and customs. Based on visit in 1952.]

NIELSEN, A. W. Grønland; Forsøg på en vurdering. *Grønland*, 1955, Nr. 11, p. 401–11, illus. [Economic conditions in Greenland; by director of Den kongelige grønlandske Handel, 1951–55.]

MALMQUIST, STEEN. Dansk patruljetjeneste i Nordøstgrønland. *Grønland*, 1955, Nr. 11, p. 412–22, illus. [History of Danish north-east Greenland military sledge patrol, 1939–45, and since its re-formation in 1950.]

OLSEN, INGVARD. Marinetogter til Vestgrønland i det tyvende århundrede. *Grønland*, 1956, Nr. 10, p. 380–88, illus. [Danish naval expeditions to west Greenland on special missions in 1912, 1914, 1920, 1921.]

GRÖNTVED, JOHANNES. Udnyttelsen af den grønlandske tang. *Grønland*, 1956, Nr. 9, p. 351–57, illus. [Greenland seaweeds; economic utilization.]

### *North American Arctic*

[CANADA. DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES] *The House of Commons of Canada. Bill 6. An act respecting the Department of Northern Affairs and National Resources. As passed by the House of Commons, 10th December, 1953.* Ottawa, Queen's Printer, 1953. [8] p. 25 cm. (1st Session, 22nd Parliament, 2 Elizabeth 2, 1953.) [Redefines new duties and functions of former Minister of Resources and Development.]

[ARCTIC RESEARCH LABORATORY] *Arctic Research Laboratory.* Washington, D.C., Office of Naval Research, Department of the Navy, 1955. ii, 34 p. illus., map. 22½ cm. [At Point Barrow. Research programme and facilities; procedure for intending research workers.]

BAGNALL, V. B. Operation DEW Line. *Journal of the Franklin Institute* (Philadelphia), Vol. 259, No. 6, 1955, p. 481–90. [Construction of radar network in Alaska by United States.]

MUNOZ, JUAN. *Juneau: a study of the Gastineau Channel area.* Juneau, Alaska Resource Development Board, 1956. 119 p. illus., map. 23 cm. [Notes, facts and figures on economic, cultural and other aspects of city.]

[ALASKA: GAZETEERS] *Index to the National Geographic Society's map of Alaska, with 3,475 place names.* Washington, D.C., National Geographic Society, 1956. 16 p. illus. 25½ cm. [Map published in June 1956.]

### *Soviet Arctic*

BOGOROV, V. G. Moskovskiy universitet i arktika [Moscow university and the Arctic]. *In* MARKOV, K. K., *and* SAUSHKIN, YU. G., *eds. Geografiya v moskovskom universitete za 200 let 1755–1955* [*Geography in Moscow University for 200 years, 1755–1955*] (Moscow), 1955, p. 107–10. [Includes account of scope and personnel of department of geography of polar lands in faculty of geography.]

Belov, M. I. Glubzhe i shire osveshchat' istoriyu sotsialisticheskogo osvoyeniya sovetskoy arktiki [Deeper and wider knowledge of the history of the socialist conquest of the Soviet Arctic.] *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva* [*News of the All-Union Geographical Society*], Tom 88, Vypusk 5, 1956, p. 475–77. [Criticism of V. D. Novikov's *Iz istorii osvoyeniya Sovetskoy Arktiki* (Moscow, 1956); factual errors in history of Northern Sea Route corrected.]

*Scandinavia (Denmark, Finland, Iceland, Norway and Sweden)*

Landmark, Kåre. Tromsø Museum og den vitenskapelige forskning. *Ottar*, Nr. 3, 1955, p. 5–8. [Tromsø Museum and its research work since foundation in 1872.]

Ytreberg, Nils Andreas. *Narviks historie*. Narvik, Narvik kommune, 1953–54. 2 vols. illus., maps. 25½ cm. [History of Narvik, north Norway, from prehistoric times to 1954.]

## ANTARCTIC REGIONS

Gedeonov, A. Chto chitat' ob antarktike [What to read about the Antarctic]. *Geografiya v Shkole* [*Geography in School*], 1956, No. 5, p. 77–78. [Select bibliography of currently available works in Russian.]

Sen, P. C. Antarctic rivalries. *Contemporary Review*, No. 1093, January 1957, p. 41–44. [Emphasizes growing tension as activities increase, but provides no relevant supporting evidence.]

Bertram, George Colin Lawder. Antarctic Prospect. *International Affairs*, Vol. 33, No. 2, 1957, p. 143–53, map. [Background to present international rivalry in Antarctica. Address at Chatham House, 4 December, 1956.]

[Antarctic: Territorial Claims] Nueva base en la Antártica chilena. *Revista de Marina*, Vol. 71, No. 584, 1955, p. 1–2, illus. [Inauguration of Chilean base "Presidente Pedro Aguirre Cerda" on Deception Island.]

[Antarctic: Gazetteers] *Geographic names of Antarctica. Revised edition*. Washington, D.C., Department of the Interior, Office of Geography, 1956. ii, 332 p. 31 cm. $2.25. (Gazetteer No. 14.) [Supersedes *Geographical Names of Antarctica*, 1947 and supplements 1949, 1951.]

[Falkland Islands Dependencies: Place-names] An ordinance to declare the place-names in the Dependencies of the Colony of the Falkland Islands which are officially accepted and to provide for the declaration from time to time of new place-names. *Falkland Islands Gazette*, Vol. 65, No. 9, 1956, p. 71. [Text.]

Roberts, Brian Birley. The Australian map of Antarctica. *Geographical Journal*, Vol. 123, Part 1, 1957, p. 82–83. [Review of second edition (revised) 1956, scale 1:10,000,000, produced by National Mapping Office, Australian Department of the Interior for the Antarctic Division, Australian Department of External Affairs.]

Leon, Pablo Arturo. Historia de la Isla Decepción. *Argentina Austral*, Año 28, No. 300, 1956, p. 34–38, illus. [History of Deception Island.]

King, J. A. Marion Island. *Lantern*, Vol. 3, No. 3, 1954, p. 298–304; Vol. 3, No. 4, 1954, p. 433–36, 440, illus. [General description.]

Aubert de la Rüe, Edgar. Mes 3 missions aux Iles Kerguélen. *Géographia* (Paris), December 1951, p. 34–41, illus. [General description of Iles de Kerguelen based on author's visits in 1928–29, 1931 and 1949–50.]

Aubert de la Rüe, Edgar. Les îles Saint-Paul et Nouvelle-Amsterdam. *Géographia*, June 1954, p. 38–43, illus. [General description of Ile St Paul and Ile Amsterdam.]

# ERRATA

The *Polar Record*, No. 54, September 1956

Page 263, line 3. *For* A. W. Carroll *read* A. M. Carroll

The *Polar Record*, No. 55, January 1957

Page 311, line 4. *After* with *substitute* the work of the Department of Geophysics.
Page 357, line 25. *Omit* J. S. Guiney, reporter
Page 357, line 32. *Omit* P. H. Tate, Cook. *The following names should be added to this list:* E. S. Bucknell, Cook, M. H. Douglas, Dogdriver, G. Warren, Geologist.
Page 359, line 46. *After* Burton *add* J. Macdowell
Page 360, line 4. *Omit* and J. Raymond.

The *Polar Record*, No. 56, May 1957

Page 457, line 44. For "Base A" *read* "Base B"

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